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TO us the most interesting phenomena connected with the recent earthquake, the most pregnant of possible future disaster, and the ones affording the strongest evidence in favor of the volcanic character of the commotion as opposed to the land-slip theory, are to be found in the underground occurrences that are, so to say, coming to the surface every day. These at once seem to indicate that the internal commotion sought relief in various and widely-separated quarters, and that heat was the initial motive power. We do not know the exact chronology of these occurrences, so we can speak of them only as we saw them recorded in various reports in the daily press. First there was the sudden overflow of a new artesian-well in Iowa, which dried up half-a-dozen wells in its immediate neighborhood, and which discharged such a vast volume of water that it threatened to wash away the town, and did overflow the bottom-land near by so as to form a small and growing lake; for the utmost efforts of local engineers, and all the talent that could be brought from Chicago could neither restrain nor stop the flow. Then the great geyser in Hell's Half Acre, in Dakotah, the largest geyser in the world, resumed operations after a rest of about seven years, and spouted up huge volumes of hot water of a temperature the highest limit of which it is beyond the possibility of science to measure. Next, a series of artesian wells in Texas, which had always given pure, sweet water, became unusable after the earthquake, because their waters had become so strongly impregnated with sulphur. And this week we noted a report from a Georgia town of an engineer of a large mill who suddenly found that no water was being fed to his boiler, and who on examination found that the artesian-well from which his feed-water was drawn now produced boiling instead of cold water, a condition of things which had put a stop to the working of his inspirator, which requires, we believe, a certain low temperature in the water which is moved by the steam jet. These facts, if facts they be, seem to show that a water-supply derived from artesian-wells is peculiarly unreliable, and cities and towns which are sinking gangs of artesian wells, as in some places in New Jersey, would do well to consider that the present cheapness of this method of obtaining water may in the end be a very costly matter, if any terrestrial disturbance should discharge into their wells a stream of hot-water, petroleum or sulphurous gas. We do not know how the water-supply of Charleston is obtained, but we presume largely from ordinary wells, and it seems to us that as sewers, drains and cesspools have probably been disrupted in many places an inquiry should be at once set on foot to discover whether the water of these wells has already been contaminated, or how soon it is likely to be by the leakage from broken containers of filth. There is not just now any place in this country we should so little care to sink a well for drinking water as Charleston, S. C.

THERE is another reason why we speak of these subsidiary phenomena as pregnant of possible future evil: they seem to presage possible ruin to those towns and cities which are wholly dependent for light, heat and motive power on natural-gas wells, if an earth fissure should either wholly release or divert into another channel this wonderful ally of modern progress. What an evil this would be can be measured by what befell Pittsburgh, when last winter some slight derangement of the supply-pipes or reservoirs left about half the citizens to freeze before fireless grates, and eat cold meals, while busy mills lay idle, and the charges in blast-furnaces grew cold. Outsiders know little of the degree to which natural-gas is now used in those regions where nature has stored it, and that from being the hobby of one or two individuals, who were looked on by their neighbors as crack-brained enthusiasts, it has become the main reliance of busy communities upon whom ruin would fall, if at any time the supply should fail. Findlay, Ohio, is one of the towns which has longest used natural-gas, for in 1838 Mr. Jacob Carr had his house piped from a well bored in his land on the main street of the town, and has burned it ever since; and for two years past natural-gas has served to heat and light the inhabitants, and operate their machinery, for the local gas company early saw that if they did not take advantage of the discovery another corporation would, and they therefore give up making artificial gas, and turned the natural-gas into the city pipes. There are now eleven gas-wells in this town, which give a constant supply, the volume of which can be measured by the fact that four of them give an aggregate yield of over nineteen million cubic feet per day, worth about eight cents per foot: of this, owing to imperfect arrangements, a large portion goes to waste, for it is estimated that during the past spring about sixteen million cubic feet of gas were wasted daily. The cheapness of this fuel as compared with coal is shown by the charges made by the local company, which are: for supply for a cooking-stove one dollar per month; for a heating-stove one dollar-and-a-half; for an open grate two dollars; for light fifteen to thirty cents per month, and for boilers one hundred and fifty dollars and upwards per year. The gas which contains 92.6 per cent of marsh-gas, 2.1 per cent of hydrogen, 3.6 per cent of nitrogen, and smaller percentages of olefiant gas, oxygen, carbonic acid, carbonic oxide and sulphuretted hydrogen is found in the Trenton limestone, about three hundred and thirty feet below sea-level, or eleven hundred feet from the surface, and so far as known is inexhaustible. About fifty towns in Western Ohio are now boring for gas.

BUT American towns are not the only ones which go to the bowels of the earth for their light and heat. We have given some account of the great oil-fields of the territory about the Caspian Sea, and the works of the Brothers Nobel, at Baku, which bid fair to have such a prejudicial effect on the American petroleum market. And now there reaches us an account of the attempt making in Buda Pesth, in Hungary, to utilize the hot-water supply which was struck last winter when boring an artesian-well in that city. At a depth of thirty-one hundred and sixteen feet a flow of warm water was encountered having a temperature of one hundred and fifty-eight degrees Fahrenheit, and the boring is being continued, in the hope of encountering water of a still higher temperature, which, if found, it is the intention of the company, which has obtained from the municipality a subvention of one hundred and sixty thousand dollars, to utilize as a source of supply for a system of hot-water heating which is to be "laid-on" throughout the city, just as the steam-supply is laid-on in New York and other places, or the hydraulic-power supply in London. Already the hot water is used in various factories, wash-houses and public baths, so that, even if water of no greater temperature is obtained, the company already has a source of income in what it has already found. If it is once proved that a municipal hot-water supply is a possible and paying enterprise, we may expect some of our enterprising countrymen to lay under tribute the numerous boiling springs there are in the West and South.

TWO or three years ago the New York *Tribune* published a serial story called, we believe, the "*Story of Mary*," which in some ways was as vivid and likely to do as much good as "*Uncle Tom's Cabin*." The writer's purpose was to show up some of the horrible atrocities perpetrated in these days in the convict camps of Georgia by the overseers put in charge of the wretched prisoners who had been hired from the State at a nominal sum to work the lessee's coal mines. The story was written by some one laboring under the lash of a generous

indignation, and gave to the reader one phase of the convict-labor question, the philanthropist's side. But, such is the sardonic irony of real life, we are accustomed to hear of the evils of the convict-labor system less often from philanthropists than from the representatives of trade-unions who seek to bring about the abolishment of the system — many of whose ways are certainly iniquitous — not through a humane desire to diminish the sufferings of their fellow creatures, but solely with a view to bettering the condition of their free fellow members, by relieving them of the necessity of competing in wages with the convicts. We believe that the injustice done to free labor through the competition of convict labor is much overated, and where it is operative is confined to limited areas, and is not at all commensurate with the benefit which the general public receives by reason of its malefactors being forced to be self-supporting in a very large degree. Congress has instructed the new Commissioner of Labor to investigate this matter, and the publication of the data collected by him will show whether the free laborer has the real grievance he now fancies he has. It seems to us that an apparently simple change in the manner of letting-out convicts to contractors would do much to diminish the present cause of complaint, and that is to require that convicts shall be leased not to the highest bidder, as now, but to the one bidding highest above a fixed minimum *per diem*, which should be the same as the minimum wage paid to free labor for the same class of work.

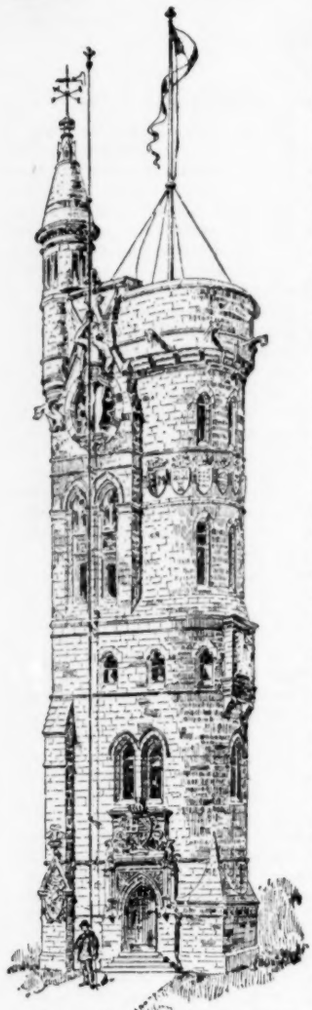
IT would not be possible for any one to foretell what novel feature of the labor trouble a week would bring to light, and yet each week develops some incident wholly unlike any that had gone before, though one might think that during the last six months the entire gamut of annoyance and unnecessary loss had been run up and down by one party or the other. The incident that marked last week seems to be more than ordinarily regrettable, as it sets an example which is only too likely to be seized on and given a vicious extension. The labor trouble in Augusta, Ga., has been attended by the usual suffering which falls on the innocent as well as the guilty strikers, suffering which it is almost as hard for onlookers who are not wholly selfish to perceive, as it is for the victims to endure. Practically the innocent have the hardest time for they are oftenest not members of organized associations and so have not even the meagre relief that is rendered by affiliated organizations in other places. The Augusta strikers are simply engaged in trying to extort higher wages from a corporation which has such hard work to keep its mills in operation that it cannot and does not pay any dividends to its stockholders, and which has showed itself to possess good feeling enough to promise its operatives that if times improve their wages shall be raised before dividends are declared. But the leaders of the strike prefer to show what they style their strength, and, rather than allow their starving fellows to earn their own bread, have prolonged the strike to such a point that it seemed imperative that relief should be afforded the strikers from some source or another. If the relief had come from private sources or organized charitable bodies no one would have a word to say against the practical wisdom of such humanity, but when it comes in the form of an appropriation of $1,000 voted by the municipal authorities one cannot but condemn the action in its relation to the special case in hand, and must consider it a most deplorable largess if it were the outcome of spontaneous human sympathy, while if it was effected by political or social manœuvring of any kind it must be regarded as the most significant event that the labor movement has developed. The possibility of obtaining from the public treasury means for prolonging strikes being once demonstrated, what is there to prevent corrupt municipal governments, such as so often have the control of the vast resources of the New York municipal exchequer, for instance, from following the example thus set, and, as it were, taxing the property-holders for means to prevent for an indefinite period their property from bringing them any income? This would be a communistic success without parallel, but yet not beyond the limits of possibility.

HOW far the educational methods applied to the masses are responsible for the labor troubles, who can say? Do they simply magnify the hardships of the mechanic's lot, or do they inculcate a spirit of philosophical endurance of evils that cannot yet be cured? The adage "there is plenty of room at the top" may hold good for individuals, but is it equally true for whole classes? The experience of Germany, which is at once the hot-bed of Socialistic movement and the centre of popular education, seems to show that the adage is fallacious, that there is such a thing as too much learning; for we have seen it stated recently that the technical schools of that country are turning out expert workmen about three times as fast as work can be found for their graduates: that is, that two out of every three are unable to find work of the kind they have been trained to do, and so must accept work of a lower grade, and perform their tasks in that discontented mood which is the favoring soil for the growth of the anarchical spirit. In this country we have not yet outgrown our needs, and we can heartily applaud what our technical schools everywhere are doing. Almost every one of our large cities has one or more of these useful schools, which are essentially similar in purpose and details of operation, and most of them give instruction to both sexes. Perhaps the most useful school is the Baltimore Manual Training School, which admits boys only, where are taught, besides mechanical drawing, the manual operations of all kinds of carpentry, cabinet-making, pattern-making, turning, founding, moulding, and all kinds of machine-shop work, besides the usual manipulations of commercial chemistry. The Pennsylvania Museum and School of Industrial Art, at Philadelphia, on the other hand, as its name betokens, devotes itself rather to instruction in the arts of technical design, and gives instruction in drawing, painting, modelling, carving and commercial designing. It has lately added instruction in the difficult art of weaving with both hand and power looms, and has placed the department under the charge of a graduate of the Government Advanced Weaving School of Reichenberg, Austria. This is one step in advance of the Lowell School of Design at Boston, which trains boys and girls for positions as designers in mills of all kinds, but does not, we believe, familiarize them with the work of translating their designs into thread. It would seem as if the graduates of either school might take a final polishing through a term or two spent in the other institutions.

IT will be remembered that some two years ago an effort was made in England to diminish the competitive evil by inducing the members of the Royal Institute of British Architects to sign an "undertaking" not to take part in any competition the programme of which did not contain certain minimum requirements necessary to assure equitable treatment for the competitors taking part: chief amongst these requirements was the employment of a professional assessor. Some thirteen hundred architects signed the undertaking, and we are hence led to infer that they abstained from competing except where the requirements were complied with. The Special Committee in charge of the matter has recently reported on the working of this scheme by publishing a summary of the competitions which took place during two years preceding the agreement and during the two years which followed it. It appears that during the first period there were one hundred and twenty-five public and limited competitions, in twenty-five per cent of which assessors were employed, while in the second period there were one hundred and thirty-nine public and limited competitions, in thirty-two per cent of which assessors were employed; so that the scheme may be credited with a gain of seven per cent in two years, which is, perhaps, all that could be hoped. On the other hand, there seems to have been a falling-off in the employment of assessors in limited competitions where, the terms of competition being usually fairer than for public scrambles, we should have expected that the greatest gain would have been made. Before the signing of the undertaking twenty-two per cent of limited competitions were settled with the help of professional advisers, while after the defensive alliance was formed only fourteen per cent of limited competitions were adjudged in compliance with the professional requirements. We hardly think the circumstances warrant us in drawing any conclusion, for it may be that the improvement in the particular direction of the employment of a professional adviser is simply the result of a "new-broom" attempt to better things, or it may be that the gain will be greater as time goes on and the general public is educated to appreciate the advantages to itself which generally would result from unprejudiced professional assistance. Of one thing we feel certain, that under even the best possible conditions public competitions — except in very exceptional cases — will never attract the best men. If committees wish to have the benefit of the help of the best men, they must conduct small limited competitions, and must base their programmes on the most equitable lines that expert advisers can formulate.

AN EDITOR'S TRIP ABROAD.[1]—XIII.

THE MUSEUM, THE RAILWAY STATION AND THE CATHEDRAL AT AMSTERDAM.—THE HAGUE.—THE PALAIS DE JUSTICE, BRUSSELS.



PROPOSED METEOROLOGICAL OBSERVATORY IN BRISTOL CHANNEL. EDWIN SEWARD. A.R.I.B.A. ARCH.T.

ALTHOUGH some of the inhabitants think that the prosperity of Amsterdam is declining, it seems to be still rich enough to provide for the simultaneous erection of three of the largest and most costly buildings in Holland; the most important of the three being the new Rijks-Museum, which has just been opened to the public, while Mr. Springer's Central Railway Station, still in process of construction, follows pretty closely after, and the new Catholic church, whose lofty cupola dominates, in a distant view, the whole northern portion of the city, promises to be nearly equally interesting whenever it is completed. As specimens of brick architecture on a large scale, all three are of great value. In the church stone is used so liberally and with such good taste as to bring the style nearly to that hybrid between stone and brickwork which is found in the best of the older buildings of the country, but the railway station and the museum form types of a tolerably pure brick architecture, rather plain in the first instance and highly ornamented in the second. Of the two, the railway station seemed to me the more successful, notwithstanding the study which Mr. Cuypers, the very distinguished architect of the other building, had evidently lavished upon it. In Holland, which is above all others the country of brick architecture, the essential roughness of brickwork and its lack of susceptibility to any kind of ornamentation ought to be understood, but the front of the museum, instead of presenting such broad, lightly-textured surfaces, emphasized by a few coarse, effective lines, as an Italian would have given it, was speckled with colored tiles and bits of sculpture, which destroyed the simplicity of the great building, while they lost nearly all their own force by being set in the middle of the mottled red-brick wall; and there was nothing in the outline of the building or the grouping of the masses to give it any special interest apart from the decoration. In regard to the inside, it seemed to me that the Dutch tax-payers might find more to criticize than an architect would. Large as the building is, covering some three acres of ground, the whole of the finished portion is completed in a style of magnificence which recalls Paris rather than homely Holland. In fact, even an architect, pleased as he would probably be with the beautiful vaulting in white brick, and the well-studied detail of the sumptuous rooms, might say with some reason that the structure seemed too large and costly for any collection of pictures that it was likely ever to contain, to say nothing of its disproportion to those at present in it; and to this oversumptuousness is added a certain complexity of plan which deprives the building of the sort of dignity which might have been more easily and cheaply secured than any other. The main vestibule, which is a noble room, well planned, and not, perhaps, too stately for the central point of so large a building, opens, on the second floor, first into a vast corridor, paved with mosaic and richly decorated, but containing no pictures nor any place for them, the walls being entirely replaced by piers between which open large alcoves, like the chapels of a cathedral, and in these are hung the pictures, lighted from windows, while various exits among the alcoves lead to the other portions of the building. Each bay is devoted principally to the works of a single painter, which is, possibly, a convenience to the student; but here the advantages of the arrangement seem to end, and one hardly knows, on entering the room, whether to regret more that so much money should have been spent on space not available for pictures, or that the effect of the room itself should be so marred by the irregular edges of the pictures in the alcoves which thrust themselves out, by the effect of perspective, in square, black masses from behind the piers. As one passes through this grand gallery, various other apartments become visible, all seductively lined with pictures, and apparently of equal importance and interest, and there would be a certain embarrassment about choosing which to enter first, were it not for the presence of a great number of zealous officials in uniform, who not merely direct but almost thrust the tourist into the room which the administration thinks it best that he should next enter, and, the same method of guidance being applied in each successive room, he arrives again at the vestibule, on his departure, with a sense of having been bunted about the building, which is not very pleasant. The remaining rooms are much better, in regard to the space which they afford for pictures, than the grand gallery, and the arrangement first devised, apparently by the architect of the Old Pinakothek in Munich, under which small rooms, or cabinets, are attached to the large galleries for the display of small works belonging to the same school as that to which the larger room is devoted, is reproduced in a manner less simple, but still very convenient. One can easily forgive a new museum of pictures, especially one on so large a scale, for being somewhat thinly furnished, as acquisitions are sure to be rapidly made, and the Amsterdam authorities have done the best with what material they had, filling up their space after having apparently displayed all the ancient works, good, bad, and indifferent, that they could get hold of, with some beautiful modern pictures, many of which appeared quite as worthy of lasting fame as the average of the old ones. So far as the plan of the building permitted, the pictures were displayed, as it seemed to me, with remarkable care in arrangement and lighting. The most noted work in the collection, Rembrandt's "Night Watch," which has been the pride of Amsterdam for many years, was, indeed, perhaps a little too carefully illuminated, the light being thrown upon it from above, with a thick screen hung under the ceiling, to shield the skylight from the eyes of the spectator, somewhat after the manner in which Mr. Bierstadt's works used to be displayed to an awe-struck audience. The effect was rather brilliant, the picture so shown attracting attention even through the doorway from the other rooms; but Rembrandt's contrasts of light and shade hardly need artificial heightening, and the effect gave to the picture a theatrical air which was not quite satisfactory.

In size, the Museum is almost rivalled by the Central Station, but the latter is, for the most part, quite simple in decoration. Some sculptured bas-reliefs are apparently intended for the recesses at present left in the low towers which flank the entrance, and this portion of the building has some other carved and colored ornament, but the rest is left with simple corbellings, or arcadings of moulded brick, to carry the main lines around the building, and the outline is well studied, but not complicated. What the plan might be I could not tell, the approach to the work being interdicted, but, except for details of arrangement, the disposition of parts would naturally be similar to that of most other large terminal stations.

The new church, the most interesting building, perhaps, of the three, since it possesses a lofty dome, which is always an object of curiosity to the architect, was practically more inaccessible than either of the others, since it was encumbered by a mass of scaffolding which obstructed the approach even to the outside. The style, however, which was a sort of conventional Romanesque, very much like that practised by the architects of modern French churches, seemed promising, and as stone was very liberally used with the brick and both well arranged and well cut, another year or two will apparently put Amsterdam in possession of an admirable church.

At The Hague, the largest of the modern buildings seemed to be the new Ministry of Justice, a very pretty and interesting structure, in the half-brick, half-stone style of the best Dutch sixteenth-century buildings, but with a strong mediæval flavor, derived, perhaps, mostly from the four-centred doorways and the detail of the metal-work. Independent of any local style the building would have been charming for its outline, and the effective placing of the openings, as well as for the detail; but it was thoroughly Dutch, much more so in fact, than any other large building in the city, which has very few Dutch characteristics. The Government of Holland is poor, and is judicious enough not to spend too much money on public buildings, so that the only other structures of much interest were the new dwelling houses, many of which were to be seen on the streets bordering the park. Unlike Amsterdam, which has very few inhabitants of rank above that of a simple citizen, The Hague is the winter residence of many of the Dutch nobility, as well as of all the foreign ambassadors to Holland, with their trains, and of some hundreds, or possibly thousands of English people, who like to live in a pleasanter climate than their own. All these persons enjoy nice houses, in open and airy situations, and most of them can afford to have such houses, so that the number of comfortable mansions in the city is unusually large, and the "Bosch," or park, which is simply a beautiful artificial forest of enormous trees, with a few open spaces here and there, and a lake into which the trees dip their branches, is fast being surrounded by those semi-suburban houses, half palace-like in the reserve of their court-yards and hidden gardens, and half open, with bourgeois simplicity, to the gaze of the multitude, which please the taste of the lesser aristocracy. Being in Holland, these mansions, with their little gardens and grounds, are of course pinks of neatness, and although, being mostly of stucco, they lack the richness of stone buildings, there is a great deal that is

[1] Continued from page 122, No. 559.

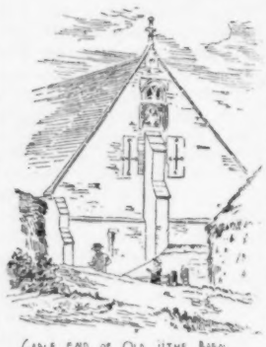
interesting about their visible planning, and the details of their execution.

After so much brick and stucco, it was rather a relief to come, in Brussels, to a city of stone architecture, and after the comparative poverty and flatness of Holland the wide streets, the perspective effect of which was much heightened by the undulation of the ground, and the great palaces and hotels seemed particularly imposing. The new Palace of Justice being near the hotel, it was not long before I found my way there, only to meet with disappointment. Huge, highly finished and costly as the building is, it cannot, as it seems to me, be called even moderately successful as a design. According to the guide-book, its style is intended to be an adaptation of the Assyrian, but nobody knows much about the appearance of Assyrian buildings, and none of the representations which exist look anything like the Brussels structure, so that the Assyrian element must, apparently, be confined to the detail, of which there is a certain amount with a Ninevite flavor, mixed, necessarily, since no Assyrian prototypes for them exist, with innumerable capitals, shafts, bases, mouldings and enrichments of other kinds, selected rather indiscriminately from the Greek, Roman and the French Neo-Grec. In fact, the detail of the building gave me the idea that the architect having the task placed upon him of immortalizing himself, had first made a pretty close study of Duc's famous building and of the other Neo-Grec work in Paris, and had then set himself to surpass them all, by the astonishing novelty of a design not merely Neo-Grec, but Neo-Grec-Assyrian. It would be a misfortune for architecture to have such an attempt succeed, and the greatness of the scale of this one did not save it. In such an imaginative, undefined style, everything depends upon the artistic capacity of the designer, and some of the Neo-Grec work is heavy, irrational and offensive in the same proportion that the best examples are interesting and beautiful, and Poelaert seems, not exactly to have chosen the worst prototypes, but to have fallen into the same difficulties as the authors of the least successful buildings in the styles. Instead of being broad, quiet, and delicately detailed, his building, like some of theirs, is lumpy and full of unexpected awkwardnesses. An architect is usually fond of trying to account for the peculiarities of a building or a design, and many of those in the Palace of Justice could, it seemed to me, be explained by supposing that its author had built it from the elevations, without studying it in perspective, or even casting the shadows with the proper accuracy and force. Most of us know from experience, the results from carelessness on these points, and one could hardly help feeling that the designer's drawing-board had constantly misled him with combinations of lines which, graceful as they might be in the geometrical sketch, took a very different appearance in execution. The most striking example of this that I noticed was in the dressings of the inner opening of the main entrance to the *Salle des Pas-Perdus*.

In this place the door-way was trimmed with a simple moulded architrave, with a pediment over it, which seems to have been intended for Doric, and probably looked very well in elevation. Unfortunately, the door was flanked on each side by a column, so close to the opening as to interfere with the ends of the pediment. Naturally enough, it looked well on paper to show the ends of the pediment in front of the columns, and if the latter had been only pilasters of slight projection the whole affair would have looked equally well in execution. As it happened, however, the columns were round, and the pediment had to be thrown forward inordinately to get it far enough in advance of the columns to have the returns profile against them. This made a heavy lump of what was probably intended to be a light dressing, and a belated and most unsuccessful effort seemed to have been made to relieve it by putting underneath it, in the narrow space between the corona of the pediment and the outer moulding of the architrave, a row of very flat modillions, or rather cantilevers, so thin at the front as to look like the edges of mutules, and pinching themselves into their narrow quarters in a way very suggestive of the devices which occur to the amateur architect when he finds that things are not coming just as he expected.

A still more unfortunate example of the same sort of miscalculation was, as I thought, to be found in the main door-way, a portal of immense size and massiveness. This was evidently intended to be very rich in design, and consists of two or three successive planes, the outer one containing an arch, within which, in elevation, is a pediment surrounded by rich sculpture, and within this again a square-headed door-way, with more sculpture about it. The detail here was rather strongly Assyrian, and in line elevation the composition must have been original, and perhaps very beautiful. In execution, however, the planning brought the pediment, with the bas-reliefs around it, so far behind the enclosing arch as to be almost completely in shadow, where their beauties are lost to the spectator at a distance, while the gigantic arch, which is considerably higher than the main walls, being detached sharply by the shadow which it casts, straddles over the entrance in a way which suggests that the building might walk out of its own door without much difficulty. Inside, the famous *Salle des Pas-Perdus* is very nearly spoiled by the same want of comprehension of the effect of the projections. Enormously high as it is, three hundred and twenty feet from the floor to the underside of the dome which forms the ceiling, the upward view is so interrupted by obtrusive bands and cornices as to make the room look, so to speak, rather long than high, and it is far from producing the effect of many much less lofty halls. So far as the execution of the building is concerned, nothing but the highest praise can be given it. The stonework, in large blocks of Echaillon marble and a bluish limestone of similar character, is perfect in workmanship and finish, and in comprehension of the position of each block; and the detail, much of which is in very low relief, is cut with exquisite sharpness and delicacy. Taken altogether, it is, with all its weak points, a most interesting building, and it is pleasant to find that the people of Brussels so far appreciate it as to have given the square upon which it fronts — one of the most central and commanding spaces in the city — the name of the architect.

ART IN ALSACE AND LORRAINE.[1]



IT is always interesting to study a portion of the history of art from a local as contrasted with a broadly-national point of view. National characteristics themselves are thus brought into stronger relief — or, more exactly, one phase and aspect thereof is shown with a distinctness it can hardly have when discussed together with other phases, other aspects. And it is both pleasant and useful, moreover, to have those creative spirits to whom a province or a district or a city has given birth, grouped for us in a separate frame. Their individualities and their mutual relationships are thus explained and — having gained in our mind a local habitation as well as a mere name — they are more clearly remembered and more sympathetically understood. And, in conclusion, a history of this sort (if at all portable in shape) supplies us with a valuable hand-book for possible occasions of travel.

The especial local history from which I am now about to quote a little is, however, a large quarto which no tourist would care to take about with him; and it differs radically in the character of its subject-matter from most others of its class. Lying between France and Germany, the meeting-place of alien races and alien tongues, at one time German, at another time French in political affinities and social affections, Alsace and Lorraine do not furnish us with a theme marked by intrinsic unity or by any strong individuality of its own. The art which grew up within their borders had no independent local root though, of course, it exhibited some characteristics peculiar to itself. It resulted from the mingling of French and German influences and its characteristics are but a natural consequence of this mingling. And the artists with brush or chisel whose names this book collects together for us are ranked, in the general histories of art, some as members of the Gallic and some as members of the trans-Rhenish school. But for these very reasons, the volume, if written from a truly impartial and scientific point of view, might have had a very special interest and value. Then, of course, it would have addressed itself directly and frankly to these facts I have noted — would have sought to unravel the threads of Gallic and Teutonic influence and to show, now how they commingle and now how they become purely French or purely German. But perhaps in this present day no patriotic Frenchman could be impartial. Certainly our author does not even make the effort. Alsace and Lorraine to him are Gallic — first and always and altogether. I remember to have read some years ago an interesting series of papers in the *Zeitschrift für Bildende Kunst* which dealt with the architecture of these same lands; and I wish I had it by me now for comparison; for, as I recollect, in the eyes of *this* author, the development of the provinces was just as wholly Teutonic; and from a collating of the two something like the veritable truth might have been arrived at. Yet M. Ménard's book contains much of interest and of value, and I do not think he would be likely seriously to mislead any advanced student; — partly because his partisanship is very frank, naïf and palpable, and partly because he does not go very seriously into the lower strata of his subject. He writes in a general, and popular rather than a scientific or an antiquarian spirit, and simply describes much more often than he criticizes. His work cannot but be instructive for the systematizing, though not greatly for the deepening or clarifying of knowledge; and it is doubly welcome as it relates to a land which is less often visited (if we except the city of Strasburg) than either of its mother-countries.

The volume falls naturally into two divisions, one treating of Alsace and the other of Lorraine. And each of these divisions is composed of two sections, the first historical and the second topographical in scheme. That is, M. Ménard traces briefly in the first place the course of art in the province and names its most important representatives (giving much more space to painting than to architecture and consequently much more to modern than to elder times), and then takes us a little journey from town to town and points out what things of interest may be found in street or museum. The plan is excellent, of course — is not the author a Frenchman?

Beginning at the beginning (with an introduction that deals with both the provinces) we learn that the country has but scanty relics of ante-Roman times to show. There are a few relics of walls built with undressed units, and a few large stones resembling the *menhirs*

[1] *L'Art en Alsace et Lorraine.* Par René Ménard. Paris: Librairie de *L'Art*; Charles Delegrave.

of Brittany and Maine; and, of course, a number of minor objects, prehistoric and later in date; though the richest collection of these (a very rich collection indeed in the Strasburg Museum) was destroyed at the time of the recent German occupation and not so much as a *catalogue raisonné* has been left behind.

When the Romans came and gradually occupied the whole of Gaul, several important routes led through these provinces to the more remote, and they were covered with structures of every kind. But so many and so fiery have been their military trials during the eighteen centuries since, that scarce an important work survives save the aqueduct of Juoy near Metz. But innumerable smaller works of art fill the local museums or are to be found in others on both sides of the Rhine — enough to prove that Roman industrial art flourished here with peculiar strength. Tombs also exist in the Vosges mountains which have peculiar characteristics of their own. Some of the funeral *stéles* now in the museum at Saverne, for instance, must be very interesting, as M. Ménard describes them as being ornamented above with carved foliage and pierced below with arched openings, the arches in some cases being *pointed* in shape. More exactly he does not picture them either in words or in illustrations.

Only a few large statues of this epoch have been found in the provinces, but statuettes are very abundant. The majority represent either Mercury or Hercules, Mercury being the greater favorite of the two. As in one of his phases he was the guardian of routes and the protector of travellers, M. Ménard finds his cult naturally predominant in a land which was, as I have said, a great highway between Rome and Eastern Gaul and was constantly exposed, moreover, to the incursions of the barbarians from beyond the Rhine. A local legend brought Hercules himself into Alsace, and told how he once forgot his club at Colmar. Even in our day, this club — pictured as a sort of mediæval mace — is the only object emblazoned on the shield of the city. Truly, the old gods are not quite dead!

M. Ménard concludes his introduction by a bold plea for the Gallicism of all art except, of course, the pure Roman, which has left a trace in either province. The race, he says, is still the indigenous Gallic race. The Romans subdued but did not exterminate it; and the German invaders of a later time left the stock unchanged — indeed, in his view, even unleavened. The fact of the Germanizing of the local speech he regards as quite unimportant. "Everything that speaks German" he says, "belongs to the German family — this is the principle so cleverly applied by Teutonic covetousness; but there is one fact which remains inexplicable. How is it that artistic aptitudes are to be met with precisely in that part of Germany once inhabited by the Gallo-Romans while the most absolute sterility is to be found in the purely Teutonic portion. If we consider the map we are convinced that the artistic development of modern Europe never crossed the Rhine or the Danube which formed the precise boundaries of the Roman empire. The Rhine in particular forms an almost absolute limit in artistic geography. Cologne, Mayence, Spires, Worms, Wissembourg, Strasburg, Basle — all the towns which contain famous monuments — lie on the Gallo-Roman bank of the river. The only important edifice which is placed on the other bank — the cathedral church at Freiburg in Breisgau — stands on a spot where the Romans established themselves, as in an outpost, in early times. The ruins of Roman baths at Baden-Willer and of others which have left traces in this part of the duchy of Baden, indicate the presence of a fixed Roman colony. Bavaria, whose ancient population seems to have been in great part related to the Celtic races, also received Roman colonies and has also proved itself possessed of artistic aptitudes for which one would vainly seek the equivalent in those parts of Germany where the Latin element has played no part."

If we try to decipher from this and many analogous passages just what it is that M. Ménard believes as an historian of art, we are left in some doubt between two interpretations. Does he think that Celt and Latin were akin in blood and artistic aptitude and that the influence of the latter merely helped the development of the former without altering the course it would in any case have taken? Or does he think that the Latin influence was the one great factor and that it simply found better ground to develop in in Gaul than it would have found in Germany? I cannot make quite sure which belief it is he holds; but in either case the Teuton is wholly left out in the cold. Of himself he could accomplish and has accomplished nothing; and when he had been influenced by the Roman or later (as we shall soon find our author noting) by the Frenchman — even then his creations are entitled but to an inferior rank. It is certain that there is a measure of truth in the theory which allows to French art a stronger influence over German development than is currently accorded — a much stronger influence than German historians are content to recognize. But it is just as certain that M. Ménard's way of putting the theory is far enough from the right way. But this is not the place to argue the matter nor is mine by any means the pen to do it.

The names of the earliest local architects (I speak first of Alsace) certainly have a Gallic, and not a Teutonic sound. Dragobod, Abbot of Wissembourg and Bishop of Spires, heads the list in the seventh century, but is known to us by name alone. Drogon, Bishop of Metz in 825 was a natural son of Charlemagne, and it is believed that the present façade of the church at Marmoutier was of his creation. Willo lived in the eleventh century, and is reputed to have been a very versatile artist, excelling especially in goldsmith's work.

As we might expect, among the most important existing relics of these very early times are the miniature paintings wrought for the many local monasteries. The finest work of this sort which the province possessed, and one of the finest to be found in any land, was an enormous volume — M. Ménard says he is tempted to name it a "monument" — called *Hortus Deliciarum*, the many paintings of which formed an entire system of Christian symbolism. Alas! that one must speak in the past tense—it was destroyed at the time of the German entry into Strasburg. Several full-page illustrations are, however, given with M. Ménard's text, reproduced from tracings fortunately made ere the work had perished. They are strongly Byzantine in feeling, and stand high among their class by reason of the nobility of design, and the strength of picturesque imagination they reveal. As always in Byzantine-tempered work of the later periods, we note a curious intermixture of Pagan and Christian motives, and a curious twisting of the former to express the ideas and beliefs of the new cult. It is interesting (at least to me) to find that this great book was the work of a woman — Herrade of Landsberg, Abbess of Hohenburg, daughter of a nobleman who was the vassal and friend of Frederick Barbarossa. She was born between the years 1125 and 1131, and her instructor in art is supposed to have been another woman — Relinde, her predecessor in the abbatial dignity.

Of course M. Ménard opens his chapter upon the history of the Pointed style in Alsace with another plea for Gallic influence; and equally of course we are better inclined to grant his assumptions here than with regard to Romanesque developments. This was the period when the architectural profession began to lie less wholly within the hands of the Church and more within the hands of laymen. It is the period, says our author, when the Freemasons first appear in history (I need hardly point out that he can be no Freemason himself, or he would be content with no such mere mushroom existence for the society); and Strasburg was the centre of the organization. "It is by the aid of this institution that in the thirteenth and fourteenth centuries ideas and tastes in art were transmitted from one country to another. The Freemasons of Alsace went to draw from the Ile-de-France, Normandy and Burgundy, the principles which they applied in their own country, and carried afterwards beyond the Rhine. The mysterious Albert of Strasburg, is considered to have been the organizer of Freemasonry, but the traditions which concern him are legendary rather than historical. The society was already strongly established in the days of Erwin von Steinbach" (I translate into the familiar form though the author writes the name, of course, with a *de*) "but arrived at its highest development with Dotzinger, and only lost its active importance after the Reformation period. Thus the three names with which Freemasonry is bound up, belong to the history of art in Alsace." Architecture, I repeat, now passed out of the hands of the clergy and into those of lay professors. The first of these in Alsace whom we know by name is Hermann Auriga, who flourished at the dawning of the thirteenth century. He was chiefly employed in civil and military constructions, especially in those of Strasburg itself, but is also the first builder whom we can connect with the great church of the town. The Romanesque portions of the cathedral—the choir and the south portal—are commonly attributed to him. The latter, however, is more properly transitional than Romanesque in style. The sculptures which adorn it are very remarkable. Its principal figures, representing the church and the synagogue are of not uncommon recurrence in Continental towns, but only, I believe, in those where the Jewish element was conspicuous in the population. The Strasburg pair are among the finest of their kind—our author says are the very finest—so it is again pleasant to note that history (not through legend, but by the witness of a well-preserved inscription) gives them to us as the work of a woman. Savine, or Sabina was undoubtedly their sculptor though she could not have been, as was formerly supposed, the daughter of the great Erwin. Her date is too early for such parentage, and if, as our author says, it is but natural to believe that she was related to some one who was in authority over the structure, this person was very likely Hermann Auriga. To her hand has also commonly been attributed the so-called "angel pillar" in the interior of the cathedral. But this, according to our author, is a work of pure Byzantine flavor, and therefore still earlier in date. From the illustration he gives, however, the architectural details appear to be transitional and *not* pure.

William of Marbourg was long declared to have been the only architect concerned in the building of the beautiful Church of St. Martin, at Colmar. But as he died in 1366, and as the structure is largely of the thirteenth century, it is not surprising that a M. Hugot, librarian of the town, should have been prompted to search for more reliable facts. Among the sculptures of the St. Nicholas portal, the oldest feature of the church, he discovered a full-length seated figure holding architectural implements, and beside it, written out in full, the name "Maistre Humbret." Therefore to this hitherto unknown hand may be attributed the chief portions of the church, and to William of Marbourg only the choir and certain minor parts, which are fourteenth century in style.

Passing over one or two less conspicuous names, it is interesting then to read what our author has to say of that great Erwin, whose name is more familiar, alike to students and to the outer public, than that of any other mediæval architect. It is needless to remark that he combats the beliefs which would make him of German birth. The name *Erwin*, he argues, does not appear in the German language until after this period, and is probably a Teutonic version of the

French "Hervé," or the older "Herpuin;" and *Steinbach*, in the same way, was probably a translation of some such Gallic name as "Pierrefont." "Moreover, the epitaph on Erwin's tomb does not indicate his birthplace, and the title *Steinbach* appears for the first time in an inscription of a period much later than that to which the illustrious architect belonged. . . . Unfortunately, the systematic destruction of the Strasburg library by the Germans, and of all the documents which it contained, obliges criticism to content itself with simple conjectures.

Erwin worked on the cathedral for many years prior to his death in 1318; but a fire which burned all his scaffoldings in 1298, and also destroyed the timber roofing of the nave, interfered so sadly with the progress of the work that it was far from being completed by his hand. The magnificent façade, however, is sufficient by itself to entitle him to the rank he has always held among his fellows. The spire, which is popularly considered the great glory of the structure, but which certainly bears an inharmonious relation to the lower parts of the façade—was not contemplated in its present form by Erwin, but was a later addition. Its history is by no means clear, but its seems as though the John Hultz, of Cologne, who is credited with its creation was two persons, and not a single artist. M. Gérard, who has inquired very closely into such questions, is cited by our author as believing that an elder John Hultz determined the shape of the octagonal tower, and conceived the idea of the four spiral staircase turrets; that the Juncker of Prague carried the work up to the springing of the spire, and that the younger John then constructed this.

Jost Dotzinger, of Worms, worked upon the cathedral at a still later day, and erected the rich Flamboyant font in 1453. As has been said, his figure is important in the history of Freemasonry. Owing to his influence the centre of the organization was definitely fixed at Strasburg, and all other lodges were subordinated to hers in which, of course, the cathedral architect ruled. It retained its supremacy on both sides of the Rhine until in 1707, the diet of Ratisbon decreed that no German city should receive laws from a French town. But by this time the practical importance of the association had long been lost.

The pictures given with this chapter of Dotzinger's font and of the St. Lawrence portal of the cathedral (which was built by Jacob of Landshut, in 1494), by no means incline us to accept M. Ménard's belief in the purely French spirit of all local art. The font, as I have said, is of rich Flamboyant work, but its design is by no means so graceful as we commonly find in true French work of the period, while a distinct German accent speaks in certain of its details. In the portal — which is forty years later in date — Teutonic feeling is still more strongly marked. It is a most interesting work, as showing the dawn of the Renaissance in a way at once very clear and very charming. The opening is square-headed, and though the details of its stone-work are Gothic, those of the door itself are largely Classic. Above the opening, in a recess formed by open canopy work designed as three sides of an octagon, is an admirable sculptured group representing the martyrdom of St. Lawrence; the portals are flanked by very elaborate polygonal piers, bearing numerous full-length statues, and finished as rich and lofty pinnacles; and the whole composition is crowned and united by an open parapet. The sculptures were executed by John of Aix-la-Chapelle; the main group is strongly mediæval in accent, and the flanking statues also show the lingering influence of the elder school, although there a rather awkward and exaggerated effort after classic freedom is perceptible in their draperies. The general effect of the portal as a whole might be counted French, but most of the architectural details are thoroughly German in form. "stump-tracery" being profusely used though rather more gracefully managed than is customary in purely Teutonic work. On the whole, the portal is, I repeat, a singularly interesting example of how *three* tendencies may meet and mingle together in a work which yet preserves unity of effect and much vigor and beauty. M. G. van Rensselaer.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE ROTCH TRAVELLING SCHOLARSHIP DRAWINGS. — PLATES XXIV, XXV, XXVI, XXVII.

[Issued only with the Imperial edition.]

UNITED STATES COURT-HOUSES AND POST-OFFICES AT ROCHESTER, N. Y.; NEW ALBANY, IND.; TERRE HAUTE, IND.; CARSON CITY, NEB.; AUGUSTA, ME.; LEXINGTON, KY., AND MARQUETTE, MICH. MR. M. E. BELL, SUPERVISING ARCHITECT OF THE TREASURY DEPARTMENT.

Color-Blindness. — A Parisian physician has brought before the French Academy of Medicine the results of his investigations concerning color-blindness. He has examined 11,175 persons. Two of these only were incapable of distinguishing one color from another, three were blind for red and six for green, eighteen could not distinguish green from red, fifteen saw no difference between green and blue or gray, and fifty-two had a peculiar weakness in color vision in general. — *New York Commercial Advertiser.*

LIGHT AND WATER-COLORS.

A Reply.

It would have been far from my wish to break a lance with so formidable an antagonist as Mr. J. C. Robinson had not the opening of the controversy in the *Times* assumed the character of a challenge to those who practise water-color painting, as well as to collectors and the custodians of our museums. I venture, therefore to enter the lists as a humble representative of the challenged party upon the understanding that, in this capacity, I am entitled to the choice of weapons.

The weapon I select without hesitation is a plain unvarnished statement of facts, together with such inferences as may be drawn from the study of a question that has occupied the attention of water-color painters long before the present discussion arose.

Convinced that *ad captandum* arguments and the recourse to exaggerated statements only divert the attention from the real issue, I will endeavor to summarize as briefly as possible the several phases through which the question has passed, and then enter upon the consideration of individual cases.

The project of lighting up the National Gallery, so justly condemned by the authorities of that institution, led naturally to the consideration of a kindred question — the condition of the valuable and representative collection of water-color drawings at the South Kensington Museum. Mr. J. C. Robinson, doubtless from a laudable desire to secure the safety of our public collections, drew attention to the deleterious influence of daylight upon water-colors, instancing the present condition of the South Kensington drawings as a proof that these works could not be exposed without risk to the light of day; but Mr. Robinson appears not sufficiently to have considered that there are other influences besides light which work prejudicially upon water-colors, such, for instance, as damp and impure air. A careful examination of the collection has convinced me that the last two agencies have been at work in several of the instances brought forward in evidence of the injurious effects of light alone. Now, as the arguments against the exposure of water-color drawings upon our walls rest chiefly upon the assumption that daylight is their greatest enemy, I wish to point out that as regards their safety from damp, impure air, and mechanical injury from abrasion and careless handling, they are better protected when placed in frames covered with glass and sealed at the back than when they are kept in portfolios or in drawers.

When the results of the official inquiry into the merits of this difficult and complex question become known, the public will be in a position to judge how far the serious accusations brought against an important department of one of our principal museums are justified by the patient and searching inquiry that is being instituted. That the decision arrived at will be an impartial one and lifted above the heated atmosphere of a newspaper controversy there can be no reason to doubt. I may be permitted, however, in the interim, without in any way prejudging the case, to record a few facts that have come under my notice during a very careful survey of the South Kensington Collection, tending to prove that the danger of exposure to light has been greatly exaggerated.

The bearing of the very beautiful collection of early English water-color drawings now on view at the Royal Institute upon the question at issue will next engage my attention, and here I have been so fortunate as to procure, in a large number of cases, exact and perfectly trustworthy data from which to form a judgment both as regards their present condition and the circumstances under which they were placed previous to their exhibition on the walls of the Institute.

Beginning with the permanent collection at South Kensington, I examined the water-color drawings seriatim, stopping here and there to note down such observations upon particular works as seemed to bear upon the question of exposure. . . .

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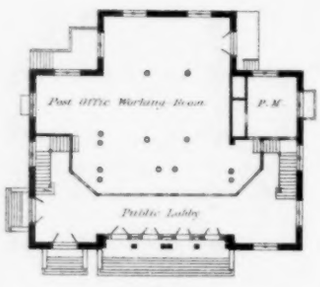

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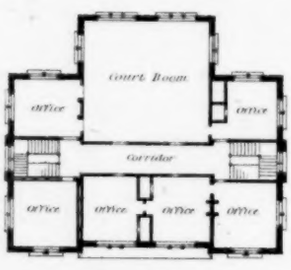

SECOND FLOOR

U.S. Court House, Post Office &c. Carson City, Nev.

M.E. Bell
Supervising Architect

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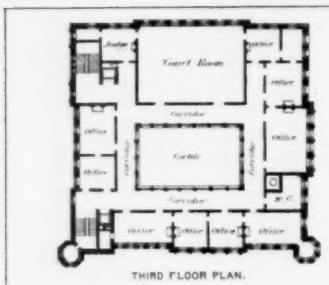
Court Room
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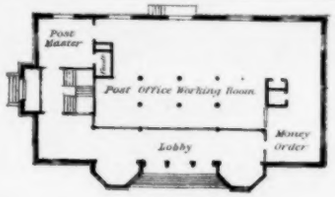

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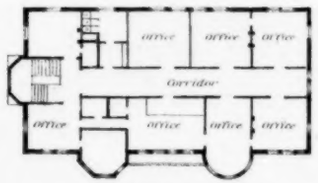

SECOND FLOOR.

Heliotype Printing Co., Boston.

American Architect and Building News, Sept. 15, 1886. No. 560

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Marquette, Mich.

M.E. Bell
Supervising Architect

Heliotype Printing Co., Boston.

American Architect and Building News Sept. 18, 1886. No. 560

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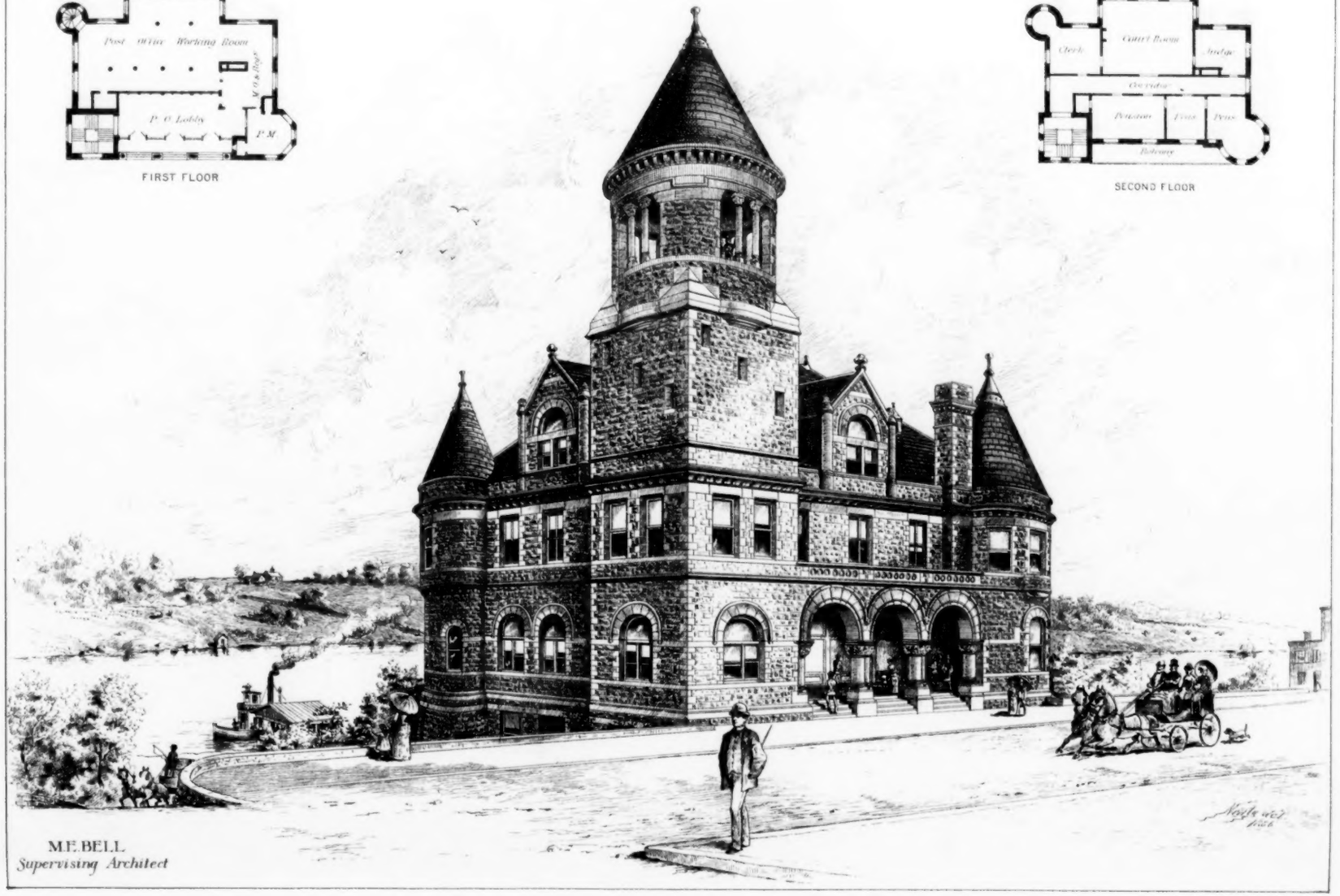

M.E.BELL.
Supervising Architect

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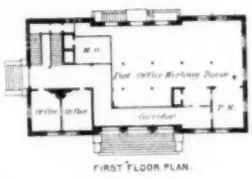

FIRST FLOOR PLAN.

M.E. BELL
Supervising Architect.

The drawings by Turner, fourteen in number, are thoroughly representative of his different styles, and with the exception of "Hornby Castle" (No. 88), the distance and foliage of which seem to have slightly faded, are in excellent preservation. The "Warkworth Castle" (No. 547), exhibited in 1799, is a splendid example of permanence. The paper in this beautiful drawing — perhaps slightly deepened in color by age — seems to justify the assertion of Sir James Linton that this work and some others that he mentions are actually deeper in tone than when they were first painted — a remark that has been perverted by Mr. Robinson into the assertion that they have gained in *brilliancy*.

Three drawings by H. W. Williams, who died in 1822, come next on my list — No. 648, "Castle Campbell," No. 649, "Loch Tummel," and No. 3018, "Bothwell Castle," painted in 1802. All three in perfect condition.

Francia, who died 1839, Nos. 568 and 625, the first faded, the second unchanged. The works of this clever artist are grey in tone, which renders it somewhat difficult to give an opinion as to what their antecedent condition may have been. The same remark applies to many of the earlier masters. John Glover, born 1767, died 1849, No. 478, "Tivoli," apparently unchanged. J. Laporte, *b.* 1769, *d.* 1839, "Conway Castle," sky and water much faded, the Indian red pronouncing itself strongly, the indigo nearly disappearing. I wish to insist upon this quality in indigo when it is associated with Indian red, because in a great number of cases this combination of pigments appears to have been the *sole cause* of fading.

Mr. J. C. Robinson, in his letter to the *Times* of March 26, makes the remark that "the more or less fugitive colors are not only by far the most numerous, but they are also the most brilliant and useful to the artist." Now here I must join issue entirely with Mr. Robinson, for, if we eliminate indigo and some of the vegetable yellows, the causes of decay are quite sufficient to justify the cry that "every fully-colored water-color drawing, framed and exposed to the light, begins to fade and change, to die in fact, from the very moment it is exposed. . . .

I now approach a series of drawings which offer a remarkable proof of permanence. I allude to the "Ellison Gift." It happens, most fortunately for my argument, that the greater part of these drawings are in their original frames. A glance at the style and condition of these frames ought to convince the most sceptical that the works they contain have been exposed on the walls for a period far exceeding the limits assigned by Mr. Robinson to the duration of a water-color drawing. . . .

Leaving this valuable series of drawing in the Ellison Gift, I will proceed to notice some others which have been selected to illustrate both permanence and change. And here I occupy more uncertain ground, as, for obvious reasons, I am prevented from ascertaining with certainty the extent to which they may have been exposed to light previous to their acquisition by the Museum.

No. 431, Cristall, *b.* 1767, *d.* 1847, "The Fishmarket, Hastings." This drawing shows no evidence of fading, but its appearance suggests that it must have been exposed to smoke or impure air long prior to its purchase by the Museum in 1873. No. 2938, Smith bequest, Eddridge, "Near Bromley, Kent," secured by the Museum according to the terms of the bequest in 1876; generally in good condition, as are the other eleven drawings by that artist. Eddridge was born 1769, and died in 1821. No. 1426, Townshend bequest, Robson, *b.* 1790, *d.* 1833, "Loch Coruisk, Skye," in perfect condition. No. 3047, Smith bequest, Bonington, *b.* 1801, *d.* 1828, "Street in Verona," in good condition. Nos. 568 and 569, J. Chalon, *b.* 1778, *d.* 1860. Both these drawings are in a bad condition. The "Welsh Landscape" has suffered from damp, and in the "River Scene" there is distinct evidence that water has run down it from above.

No. 3013, Smith bequest (1876), Cotman, *b.* 1782, *d.* 1842, "Dieppe." The color is unaltered, but there are mildew spots in the sky, pointing to damp. The other drawings by this artist are in good condition. No. 564, D. Cox, "Cottage near Norwood," in perfect condition. No. 158, D. Cox, "Moorland Scene," signed and dated 1854, quite unchanged. I have omitted to notice two other drawings in the Ellison Gift, which I here add to that important series — namely, No. 1011, J. Barret, "Landscape Composition," original frame, and No. 1012, J. Barret, "Weary Trampers," signed and dated 1840, both in a perfect state.

In order to justify the censure directed against the authorities of the Museum by Mr. J. C. Robinson for neglecting the necessary precautions for securing the safety of this collection, it will be necessary for that gentleman to prove that the unsatisfactory condition of some of the drawings, which I have not hesitated to notice above, has been brought about since they have been placed upon the walls of the South Kensington Museum.

It now remains for me to notice the interesting series of drawings by Cozens, included in the Dice collection. As regards their present condition they speak for themselves. I see no evidences of change, but they offer a valuable illustration of the method of work adopted by the early school of English water-color painters, being executed first in monochrone and then heightened in effect by thin washes of local color. This conventional treatment was followed by Turner in his early works, which in many instances have been actually copied from drawings by Cozens. Turner, however, very soon emancipated himself from the trammels of his instructor, his instinct for color leading him to see that one monotonous tint was quite inadequate to express the varied hues of shadows as seen in nature. Girtin shared with Turner in this just discrimination, and, even in the few years of life allotted to him, was able to effect a revolution in the practice of water-color art. The seven drawings at South Kensington appear to be well preserved, but as the turning point in the history of English water-color art it is to be hoped that the authorities of the Museum will be able to enrich their collection by other and more striking examples.

Passing to the works of an artist belonging to a totally different school, I will next notice the large drawing by George Cattermole, the "Diet of Spiers." This work having been particularly alluded to as an instance of fading, I wish to ask why it is that other drawings by Cattermole belonging to the same series (the Ellison Gift) and exposed to light under the same conditions offer so marked a contrast. The answer to this question is very simple. The "Diet of Spiers" is a very early work of the master. It is executed on white paper in transparent color. At an early period of his career Cattermole discovered that the use of white paper was not congenial to him, and he soon abandoned it for the peculiar gray coarse paper used, I believe, for wrappers by the papermakers. Upon this material he painted frankly in body-color (*gouache*). This method, so well suited to the impetuosity which characterizes his work, he pursued to the last.

The drawing in question, regarded as a work of art, could never have competed with his later productions, but I have it upon the authority of one of Cattermole's most intimate friends — a gentleman still living, and who is the contributor of some of the finest productions of the master in the present exhibition at the Institute — that this particular drawing was allowed to remain uncovered for weeks together at the engraver's, exposed certainly to dust and possibly to damp.

The drawings by Holland may also be compared with advantage with those at the Institute, these latter being authenticated as having been for many years exposed to full daylight. I am unable to discover any appreciable difference between the works of this artist as represented at the South Kensington Museum and those now on view at the Institute.

I will close the notice of the South Kensington drawings, necessarily imperfect, by a reference to a work by Wm. Hunt, because it has been cited by Mr. Church in evidence of fading under the treatment to which it has been subjected at the Museum. The drawing in question is obviously an unfinished one. This the pencil-marks still left in the background would suffice to show; but I would call attention particularly to the melon, the principal feature in the work. This portion of the drawing has not faded, for the color has never been there. It is simply a *laying-in* with body-color previous to its completion in transparent or glazing colors — a process familiar to oil painters, but seldom resorted to by water-color artists except in the case of William Hunt.

We come now to the region of facts, not only as regards the actual condition of some of the finest specimens of water-color art that have ever been gathered together, but also to that chief element in the question, the history and antecedents of a considerable number of them.

I allude to the collection at the Royal Institute which the energy and perseverance of Sir James Linton have enabled him to present to the public as a proof that the hasty and sweeping charges brought against one of the most beautiful arts of our time have not been substantiated and are incapable of verification.

Presuming that most of the readers of this article have personally inspected the collection in question and that the perusal of Sir James Linton's preface to the catalogue will have explained the objects of the exhibition, it will be sufficient to state briefly that it was intended to confute a mischievous fallacy which by its wide circulation through the medium of a powerful journal is calculated to mislead the public into the belief that one of the richest and purest enjoyments of our lives — the contemplation, namely, of the works of the greatest English water-color painters of a past generation — is a fleeting delight which can only be indulged in under conditions that are troublesome and difficult of attainment. Who can compare for a moment the satisfaction we derive from the inspection of works in a museum with the enjoyment of water-color drawings exposed upon our walls? The critic or dilettante visits the British Museum to compare styles or to verify a date, and it is well that this opportunity should be afforded him, but the pictures upon our walls appeal to a different and I think a higher faculty. Who is there that, being the fortunate possessor of beautiful works of art, will fail to admit their humanizing influence? and how the aspect of a "Turner" or a "David Cox" diverts his attention from the petty cares of life, the *res angustæ domi*, and even helps to soothe him under the pressure of greater troubles?

I would wish to point out that the objects of the permanent collection at South Kensington and the much smaller exhibition which I am now about to notice are widely different. The South Kensington Museum is above all an educational institution, and its art collections are brought together with the distinct intention of guiding the student in the investigation of the history of its different branches. Hence the condition and the qualities of individual specimens have been less regarded than the position they occupy in the category they are intended to illustrate. The exhibition of early English water-color painters at the Institute consists of the contributions of

various collectors and connoisseurs, who have kindly lent their works for the purpose indicated. In the former case I purposely selected for notice many of the drawings which at some period of their existence had suffered injury from the treatment to which they had been subjected, with the view of showing that in numerous cases other causes besides exposure to light had been at work. With regard to the Institute collection no such discrimination is required, for they are nearly all in admirable condition.

I will proceed to notice a few of these drawings. The three magnificent Turners, now the property of Professor Ruskin, occupy — as their transcendent beauty entitles them — a central place on the walls of the Council Room. Of the drawing No. 90, "Scene in Savoy," I am enabled to state with absolute certainty the following particulars. Professor Ruskin speaks of it in these terms: "It is a very early drawing, certainly not later than 1812 or 1814, and I cannot conceive of it as ever more beautiful than now." To my personal knowledge the "Scene in Savoy" was hung on the walls and exposed to ordinary daylight for upwards of twenty years. Mr. Ruskin proceeds to say: "The Devonport and Salisbury were hung in the excellent light of Mr. Windus's drawing-room at Tottenham, and came from Tottenham to Denmark Hill." No. 8, Turner, "Tintern Abbey," exposed to light ever since it was painted in the year 1800. The practice pursued by Professor Ruskin of covering up his Turner drawings during a portion of the day, although, as evidenced by the condition of many works by Turner, by no means a necessary precaution, is to be advocated as an exceptional measure, owing to the extreme tenuity of many of his tints and the subtle gradations of color upon which so much of the value of his work depends. It is well known that paper when excluded from the light acquires a yellow color by age, an effect similar to that produced upon oil pictures. It is, therefore, in every way desirable that delicately-tinted water-colors should be alternately covered over and exposed to light. The opinions of Professor Ruskin upon all matters relating to art stand in no need of advocacy by me. Every line that he has written will be remembered and quoted long after the present controversy has been forgotten; but as he has been charged with inconsistency, it is well to remember that he only advocates this precautionary measure in the case of drawings by Turner. . . .

I have now, I trust, succeeded in verifying my original statement that a very large number of the drawings in this remarkable collection have been exposed to full daylight without appreciable change. The publicity given to the statement of Mr. J. C. Robinson has induced me — I fear at the risk of wearying the reader — to go into much detail. This has been inevitable, for it is only by the reiteration of particular facts that it has been possible to meet general accusations. As regards the present condition of the drawings, they speak for themselves.

In a letter from Mr. J. C. Robinson recently addressed to *Truth* the following passage occurs: "What is there to show that many, perhaps even the majority, of these drawings may not, for the greater part of their time even, have been kept in the dark in portfolios, or otherwise carefully protected from the light? This has certainly been the case in some instances; and if this can be proved, is not the exhibition at least sailing under false colors?" I trust that the information I have been enabled to procure is a sufficient answer to these questions. Had the collection at the Institute consisted solely of works that had been exposed to daylight, Sir James Linton would have laid himself open to the charge of having purposely excluded every drawing which told against his argument. It might have been supposed that the mere fact of such a collection as this having been secured in *little more than a week* would have been sufficient to refute the absurd accusation that members of an honorable profession have banded themselves together in order to propagate a falsehood — for this in effect is the charge hurled against them.

Before concluding this branch of the subject, which is intentionally devoted to the enumeration of facts, I wish to call attention to the condition of a small but well-selected collection of drawings in the possession of my friend, Mr. Henry Drake, of Kensington. This gentleman has not only afforded me an opportunity of carefully inspecting the works in question, but has given me the assurance that they have been hung on his walls for twenty years, and for about the same time on the walls of their former possessor. Being most of them in their original frames, it may be taken for granted that they have been exposed to light for more than forty years. I think that their present appearance would be a revelation to those who hold that the period of thirty years arbitrarily fixed upon for the duration of their existence so far as color is concerned, has been far exceeded. The collection comprises drawings by the following artists: W. Muller, Copley Fielding, David Cox, G. Cattermole, E. Duncan, G. Fripp, P. Naftel, and others, all in admirable preservation. No special precaution has been adopted with regard to these drawings, except their protection from *direct* sunshine.

The difference between the effects of direct sunshine and diffused light are so enormous that I was long under the impression that they differed in *kind* as well as in degree. The inquiries I have instituted concerning this matter have led me to modify this opinion, but practically my conviction remains the same, and I think the above facts attest that there is a gulf between the effects of sunshine and ordinary diffused daylight — an assertion that no one who has practically studied the subject will be able to deny. The exclusion of the direct rays of the sun from water-color drawing is a condition of their preservation in the state in which they were produced; and had the discussion opened with a recommendation to that effect, I am convinced that the controversy would have been pursued in a very different tone from that it has unfortunately assumed.

It is to be observed that in his first letter to the *Times* Mr. J. C. Robinson takes no notice of the varied pigments employed by different artists, but pointedly asserts that *all* water-color drawings are doomed to destruction unless guarded from daylight, thus leading the uninitiated reader to conclude that *all* the pigments employed by water-color painters were open to the same objection. It was not until Professor Church took up the question and pointed out the particular pigments that should be used with caution, that Mr. Robinson descended from vague generalities to the consideration of really important factors in the question. It is, however, worthy of remark that Mr. Church is more exercised in his praiseworthy endeavors to promote the study of the chemistry of pigments among living artists than in vain regrets over the ignorance or indifference of some of the greatest artists of the century concerning the pigments they employed.

The greatest master of landscape painting — the man who occupies a solitary pedestal in Walhalla of landscape art — was admittedly careless in this respect. In whichever medium he worked, the one consideration by which he seemed to be guided was the production of the effect to which he was urged by the inspiration of the moment, and this especially with regard to the scheme of color he adopted, which induced him to select the colors which were the best exponents of his ideas. Turner was probably little troubled by the question of durability. As Mr. Ruskin happily remarked, "He feels in color, but he thinks in light and shade." The rich enjoyment which the mere practice of his art must have afforded him was untempered by anxiety as to the future of his work, and was akin to the satisfaction of a great musician who draws sweet tones from his instrument.

It is from these considerations that I should feel disposed to exclude the water-color works of Turner from the walls of our public galleries, except under the conditions which in the National Gallery render them secure from injury.

Passing on to the lesser lights, the men who, admirable in their way, are only second to Turner, it would be a misfortune were we to be deprived of free access to their works so long as they are placed under vigilant care.

The pessimists, happily few in number, would have us believe that the durability of pigments, as regards the effect of daylight upon them, is in the inverse ratio of their usefulness. This is fortunately far from being the case. The fading effect of light upon certain pigments is almost confined to those of organic origin, many of which have been but sparingly employed by our best water-color painters.

Sir James Linton expresses the opinion that certain drawings have even become richer and deeper in tone than when they were first painted, but he is represented by Mr. J. C. Robinson to have said that they have gained in *brilliancy*, which is quite another thing. The desiccation of the size in the paper, as well as the gum and other media employed in the manufacture of water-colors, may have conduced to this quality, a change which is analogous to the darkening of the oils and varnishes in oil paintings.

It has been hinted that artists are not entitled to a hearing on this question of durability, on the ground that they are influenced by interested motives. The truth or fallacy of this accusation must depend upon the meaning attached to the word. In one sense artists are certainly *interested* witnesses, but if sordid motives are attributed to them such an imputation must be emphatically disclaimed. Mr. Robinson may rest assured that the sincerest admirers of the early school of English water-color painters are to be found in the ranks of living artists, who would view with dismay the dissolution or decay of the priceless treasures which have been bequeathed to us.

Many artists have themselves instituted experiments upon the pigments employed by painters in both materials, but they have hitherto been of a desultory nature, and not pursued with sufficient system. The investigations of Professor Church have been of great value in this respect, and whilst deprecating the animus exhibited by Mr. J. C. Robinson, both as to the matter and the manner of his attacks, I am quite ready to allow that good results may follow from the inquiry that he has instigated, and whilst separating the good seed from the chaff let us remember the old adage: *Fas est et ab hoste doceri.*

Before this controversy began, people were becoming weaned from the fallacious doctrine that works executed in water-color were necessarily less permanent than those "protected" by the oils and varnishes with which they were painted, and it is to be hoped that this scare will not deter them from reconsidering the verdict that all water-color drawings which have been long exposed to daylight have been irreparably injured.

Mr. Robinson contends that one of the causes of the greater stability of oil paintings is the circumstance that the pigments are employed in far greater volume than in water-color painting, strangely overlooking the fact that the early painters applied the colors with remarkable thinness, as may be seen in the works of Jan van Eyck, Albrecht Dürer, Holbein, and in most of the early Italian masters. It is moreover to be noticed that these works were

painted on a white *gesso* ground, and probably in water-color. The use of oil or varnish was an after-process employed in finishing the picture. I am aware that I am now treading upon debatable ground, but there is high authority for the assumption. Now these so-called oil paintings are precisely the works which excite the admiration of the world not only from their inherent beauty, but from their extraordinary durability.

The practice of loading the color belongs to a later date, and I have yet to learn that it conduces to their permanence. That light is not without its influence upon certain pigments, even when they are "locked up" by oil or varnish, is evidenced by the fact that numerous examples of the Dutch school have suffered in this respect.

Landscapes by Hobbema, Both, and Ruysdael, frequently show fading in the greens of their foliage. In these cases yellow glazing colors of vegetable origin have been employed, which, being fleeting, have passed away, leaving a cold blue green underneath. Such examples might be multiplied, and they extend even to the Florentine and Sienese schools of the fifteenth century, and especially in the flesh tints of Botticelli, whose works, graceful and refined as they must always have been, may even have acquired a certain pathos from the pallor that has ensued owing to the use of pigments prepared from cochineal.

I mention this fact in order to show that the fading effects of light upon certain pigments is by no means confined to water-colors. On the other hand, the durability of flax, which material is the foundation of all good drawing paper, is abundantly proved by the wonderful preservation of linen in the Egyptian tombs.

"Pure old water-color painting upon pure old rags" — such is the panacea offered by the greatest art critic of the day, to pour balm into the wounds of those who hold that all water-color drawings are doomed to extinction when exposed to daylight.

In the opening pages of Mr. J. C. Robinson's article in this *Review*, to which I have presumed to offer a reply, he says that in his first communication to the *Times* he did not intend to provoke a controversy, by which, I suppose, he means that, the fiat having gone forth that all water-color drawings were for the future to be considered as inherently perishable, it would be presumptuous for any one to dispute either the premises with which he starts, or the conclusions at which he arrives.

Not being in a position to speak *ex cathedrâ*, and having to face the proverbial difficulty of proving a negative, I have ventured to embark in a controversy with an assailant in whom fluency and wealth of illustration are happily blended. But, fortunately for ourselves, combatants have been enlisted on our side who combine a practical experience of the art in which they excel with the critical faculty which renders their testimony of the highest value. As any definitive judgment upon the merits of the case can hardly yet be expected, we must look to the gradual enlightenment of the public for the decision of a question that concerns every lover of art.— *Frank Dillon in the Nineteenth Century.*

SPIRES.

THE tall spire, conveying to the mind an idea of immeasurable height, and seeming to fade away in a point, is, perhaps, the most perfectly beautiful external feature of the Pointed or Christian styles of architecture to which it properly belongs. In all ages and countries there has been an apparent tendency to carry buildings to as great a height as possible, and hence have originated the various architectural forms of pyramids and obelisks, towers in endless variety, domes of various shapes — Classic, Byzantine and Saracenic — the minarets of the East, and tall monumental pillars; but the spire, obvious as its form seems in its pure simplicity, was unknown in architecture until towards the end of the eleventh century. There have been many discussions, somewhat unprofitable, though interesting, as to the source whence the mediæval builders drew their first ideas of the pointed arch and spire, and general opinion has apparently settled to the conclusion that the pointed arch was simultaneously suggested to the various nations of Europe by the sight of the Saracenic arch during the Crusades. If this were really so, it must be added that the genius of the Christian builders improved so vastly upon any hints they may have received from the East that all traces of such origin rapidly disappeared. The spire, however, is a purely self-evolved feature, which originated in the general tendency of Pointed architecture, completely independent of external hints or examples. Among other suppositions, it has been said that the form of the spire might have been suggested by the pyramids or obelisks of Egypt; but there are so many points of dissimilarity between these objects and the true spire that it is extremely unlikely. It is usual to refer to the pyramidal covering of the tower of Thaon Church in Normandy, built towards the end of the eleventh century, as the earliest example of a spire, but it is hardly correct to call this a spire at all. It is neither more nor less than a small pyramid, square in plan and with sides formed of four equilateral triangles, the stones of the interior being left rough, and overhanging each other. There are several pyramidal roof coverings of a like nature, erected about the same date in Normandy, and incorrectly spoken of as early examples of the spire; but the true spire was not developed until the square plan, which is of the essence of the pyramidal form, was abandoned.

Early native Indian architecture made some approach to the form of the spire, but never actually reached it. The typical Indian temple was a cubical building of small dimensions, and some temples at Benares have roofs which rise to a great height compared with the building, and have a straight outline tapering to a point. Others, as in Orissa and elsewhere, are varied in shape by projections on the plan, and are covered with a lofty roof which follows the plan of the building to its apex, which it reaches with a considerable outward curve. We also meet with pinnacles and other ornaments on these lofty roofs, somewhat resembling those applied to the spires of Christian art, but none of them can properly be called spires. The tall *gopuras*, or gateways of Southern India — which our forefathers used to call pagodas — are, properly speaking, towers which diminish in size as they ascend, and although of slightly tapering form have no affinity with spires. The utmost that can be said of the spire in Indian architecture is that it received a very imperfect development, if any; but even this there is no historical reason for supposing that those who built the first Christian spires ever saw, or had the least knowledge of.

The pyramidal roofs above named, combined with the pointed terminals, often employed on buttresses and turrets in the Later Norman and Early Pointed styles, were the immediate precursors of the spire, and its form was probably suggested by them, although Mr. Fergusson was of opinion that the spire took its origin from the gable termination seen in some foreign towers. They, however, generally corresponded in plan with the structures to which they gave a finish, and rose to no very great height. Thus the square towers had square pyramidal roofs, which rose direct from the outer surface of the walls, and, therefore, were without parapet or space around the base. They were also necessarily of very low proportions compared with the octagonal spires of later date, as may be seen in the Norman churches of Thaon, before mentioned; of Comornes, near Bayeux; of Basly, near Caen; and of Rosel. Circular turrets had circular spirelets or cones, and at Rochester Cathedral there is an octagonal turret, which has a small octagonal-pointed covering like an incipient spire. The square pyramidal roof had also an unavoidably heavy effect, with a too strongly-marked diversity of light and shade.

The true spire, however, received its finest development in England, and its introduction was coeval with the Early English or Lancet style. Its distinguishing characteristics are — its general octagon plan, the very acute angle to which it ascends, and the simplicity of its straight outline.

In the first stage of development of the Early English spire, it was still little more than a stone roof, like those of Normandy; the tower on which it was erected had no parapet, the spire came down with dripping eaves, and was supported on a corbel-table. There are very few spires remaining of this period, it having been most common to construct them of timber, which has perished long ago; although spires must have been very numerous, it being evident, from the construction, that nearly every tower of any importance was designed with a view to a spire of some kind, although to this rule there are exceptions in some districts — that of South Northamptonshire, to wit, where parapets and low roofs were placed on some small towers from the beginning. In some cases the stone spire, which afterwards replaced that of timber, retains the form of its original — namely, square at the base, though immediately becoming octagonal, so as to give the cardinal faces the appearance of being spread out in an awkward manner. This is the case at Etton, which has dripping eaves. At Aylstone and some other Leicestershire examples, the spire is connected with a sort of parapet; at Denford, Northamptonshire, with a parapet and pinnacles at the angles.

The name of the "broach spire," or as it is still called in some parts of England simply the "broach," is commonly given to this, the earliest class of spire in England. A broach spire springs directly from the eaves of the tower walls. It was at first entirely without parapets or gutters, being made simply by shaving off the corners of the tower at the top, and so creating an octagonal platform, with which the spire exactly corresponded, and from which it naturally ascended in its unadorned simplicity. Another kind was formed by chamfering the spire upwards from the corners of the tower; in other words, a square spire was placed on the tower, and its angles were shaved off from the apex to a point near the base, where the cutting was continued obliquely to the corners of the tower. But the genuine broach spire is octagonal from its base; the cardinal faces hang down over the eaves, and the intermediate faces are connected with the tower by conical *squinches* — *i.e.*, arches thrown across the corners within, and finished on the outside in a slope. On the proportions of these squinches, the effect of the spire in a great measure depends. An example of this spire, though of later date, is to be seen at Warmington Church, Northamptonshire; also at Wansford and Polebrook, Bampton and Witney in Oxfordshire, and at Bayeux Cathedral, St. Etienne at Caen, and many other places. At Witney and

at Oxford Cathedral are examples showing that pinnacles may be very well combined with a broach spire, either with or without turrets at the corners of the tower. As the geometrical styles advanced, spires became more lofty, and lost much of their massiveness; the spire lights had less projection, the squinches became smaller, and frequently carried pinnacles.

In the Decorated period a great many broaches were still erected, but there were many instances of deviation from it; that is to say, there were many examples in which the cardinal faces did not spring directly from the walls of the tower. This change resulted in the spire becoming, so to speak, an incidental appendage to the tower, rather than an essential portion of it. Yet there was a feeling against allowing the spire to seem quite unconnected within the parapet. Squinches gave way to pinnacles, and, in many beautiful instances, to flying-buttresses. The spires became more acute and lofty, as they rose from an octagon formed in the roof of the tower instead of from the tower itself. The walls of the tower were terminated by a parapet; and an open space within was left round the base of the spire, which formed a gutter. In the triangular spaces formed at the corners pinnacles and clusters of pinnacles were placed, from the midst of which, in the finest examples, the spire itself rises, apparently, only the central and loftiest pinnacle among a forest of smaller ones.

St. Mary's, Oxford, affords a fine example of this clustered and pinnacled spire. It rises from the tower not like a roof, as the broach, nor yet like something altogether unconnected. The junction of the tower and spire is effected with inimitable skill, although neither, taken alone, is worthy of the mode of connection. Both are rather bare; but the pinnacles are of elaborate richness. The spire is utterly plain; but than the grand array of pinnacles, nothing could be nobler. Clustered pinnacles arise from the double buttresses; these support taller pinnacles between themselves and the base of the spire, and from the midst of them rises the spire itself. The spires of this period do not differ much from Early English, except in detail and enrichments. Besides crocketing and ribbing, there are frequently bands of panelling at various heights, and the openings are more enriched. One of the finest spires of this period, that at Salisbury, is the loftiest in England, rising to about 387 feet. The spire of Old St. Paul's Cathedral, which was completed in 1422, and destroyed in the great conflagration, was, however, the loftiest in Europe, having been 500 feet high. This was of timber, and covered with lead. Such spires are still common, the lead being lain on in flat sheets; others have lead in narrow strips, laid diagonally. Timber spires are also very common in Germany, and the northern countries of Europe, and are often disfigured by bulbous excrescences, which do not originate from any consistent principle of construction, and greatly detract from the simple beauty of outline which ought to be the chief characteristic of the spire. To treat of only a portion of the eccentric forms to be found in German and Scandinavian spires, which are rendered possible by the facility of working in timber, would be too lengthy a task. A very instructive drawing of one, showing its unnecessarily complex construction, as contrasted with the simple stone spire, is to be found in Pugin's "*Principles of Pointed or Christian Architecture*" (page 8). Detailed drawings of the carpentry of timber spires are given in Viollet-le-Duc's "*Dictionnaire de l'Architecture Française*" s. v. "Flèche."

In the Perpendicular period the broach spire had not quite gone into disuse; but it was chiefly confined to the border-line between Northamptonshire and Leicestershire. In other places the spires followed the same general arrangements as previously, the variations being principally in style of decorations. There were, however, many varieties formed by combining, in various proportions, the peculiar features of preceding styles. Hence we have: (1) Spires with parapets, rising unconnectedly from within a battlement, with or without small pinnacles at the angles, or from various parts of the battlements, but without flying-buttresses. (2) Spires with flying-buttresses, from the angle pinnacles to the spire, which form the genuine and distinctive feature of the spire of the Perpendicular period. A most beautiful example is afforded by the spire of St. James's, Louth, Lincolnshire. Others occur at Rushden, Thaxted, Moulton, Whittlesea, Cambs, Hanslope, Bucks, King's Sutton, and many other places. (3) Spires set on octagons. This form became common in the Perpendicular period. Sometimes the tower is itself the octagon, but more frequently the octagon merely forms an intermediate stage between the square tower and the spire, by which the various methods of joining the square and octagon are transferred from the spire itself to the two portions of the tower. The result is not quite pleasing; the octagon appears a less satisfactory support than the broader mass of the square tower, and it often seems as if the lower part of the spire had been shaved down vertically. The finest example of this kind is to be seen in the Church of St. Michael, Coventry; but in looking at it, and at most others of the same class, one can hardly avoid the idea, that the octagon is taken out of the height of the spire. Other examples, to which the same remarks apply, are at Exton, Rutlandshire, and at Wilby, Northamptonshire. (4) Flying spires. Of these there are very few examples; the best known is at St. Nicholas, Newcastle-on-Tyne, where a sort of crown is supported in the air over the tower. Enormous angle turrets, with spirelets, support huge flying-buttresses, and these bear aloft a small square tower, which has its own parapet and pinnacles, connected by flying-buttresses, with a small octagonal spire. The ingenuity of construction is something marvellous; but the difficulty of carrying it out must have been enormous. Sir Christopher Wren imitated this in the steeple of St. Dunstan's-in-the-East, London. Others of the same class are at St. Giles, Edinburgh, at Linlithgow, and at Aberdeen.

The technical construction of the spire is a subject of great interest, but requires treatment at greater length than could be given in this article. — *Building News.*

THE SEVERN TUNNEL.

WITHIN a few days of twelve months ago the railway tunnel constructed by the Great Western Railway Company under the river Severn was completed and informally opened by an experimental train being successfully run through. A few months later a goods train travelled through from Aberdare to Southampton, but even then the tunnel throughout was not ready for general service. Much more had to be done in regard to absolute pumping and ventilating machinery, and the completion of other extensions of the line in connection with the tunnel. Since January this work has been energetically prosecuted, and at last, on Wednesday, September 1, this important addition to the company's system is to be opened — only, however, for goods, for something yet remains to be executed before passenger trains can be introduced, but even for goods alone the tunnel will be of great value. Compared with such gigantic works as the St. Gothard Tunnel, nine and one-fourth miles long, the Mont Cenis Tunnel, seven and one-half miles long, and the Arlberg Tunnel, six and one-half miles long, this Severn Tunnel may perhaps be considered a small affair, but it is four and one-half miles long altogether, and it is the longest subaqueous way yet made. It is also the longest tunnel in England, and its construction has been attended by circumstances of difficulty peculiar to cuttings under water, such as are not experienced in the boring of land subways. In the latter operation there may be, and often have been, serious obstacles to overcome owing to the nature of the material to be penetrated, and in some cases springs have been tapped, which caused inconvenience; but the quantity of water was not very great and was easily withdrawn, and powerful drilling-machinery has been employed to pierce the rock. In tunnelling beneath a wide river there have to be faced not only the ordinary conditions of strata and underground springs, but also the risks of an inflow of the stream above. This danger was happily not realized in the construction of the Mersey Tunnel, but that tunnel runs for only a mile under the water, and the river at that point is, as a rule, comparatively calm. The Severn undertaking, however, presents a very different story. At the point chosen for the tunnel the river is two and one-fourth miles wide, and this estuary is described as more ocean-like than that of any ordinary English river. Moreover, it is characterized by rocks of a dangerous and solid nature, and there is a difference of as much as sixty feet between high and low tide. These circumstances would not necessarily cause an incursion of water, but, as a matter of fact, the construction of the tunnel was several times stopped, and the whole undertaking jeopardized both by river and land water. Considering the impediments that have had to be overcome, together with the period occupied, the execution of this work may rightly be regarded as a great feat of engineering skill, and the opening of the tunnel for actual, though partial public service, is an event of real importance.

When the great Western system was carried on to Bristol by Mr. Brunel, the intention was to connect it with South Wales by a steam ferry, capable of carrying across the Severn, not only passengers, but even loaded goods trucks. Subsequently, however, it was found that only a passenger ferry would be practicable, and consequently up to the present the goods and minerals have had to be taken by a circuitous route in order to cross by a railway bridge. Powers to make this tunnel were sought as far back as 1864, but the attempt failed then, as did likewise a second effort in 1870. In 1872, however, an Act was obtained, and the company straightway proceeded with the enterprise. Several shafts were sunk on both sides of the river, and the works were carried on from each end. An experimental heading, about seven feet high by seven feet wide, was driven through, and good progress was made. In October, 1879, however, when the two headings were within one hundred and twenty or one hundred and thirty yards of meeting, the heading under the Monmouth shore tapped a big fresh-water spring, and in twenty-four hours that half of the work was flooded. Up to that time Mr. T. Richardson was the engineer conducting the work, Mr. (now Sir

John) Hawkshaw acting as consulting engineer, but after this disaster Mr. Hawkshaw became engineer-in-chief, with Mr. Richardson as coadjutor. Upon his advice the bottom level of the tunnel was lowered by fifteen feet, and in other ways the original design was altered; the company also transferred the work of construction by contract to Mr. J. A. Walker.

Two brick dams of enormous strength and great thickness were built across the heading down which the water had flowed in, and thus further approach to the shafts and works under the Severn was prevented. Powerful pumping-engines were then set to work, and by the end of the year the water was withdrawn and excavation could be resumed. During the operations of clearing the works a very difficult and dangerous task was accomplished by a diver named Lambert. At a distance of one thousand feet from the bottom of the Sudbrook shaft there was a door, which required closing across the drift under the river. Assuming a Fleuss diving-dress, and carrying a heavy crowbar, Lambert descended the shaft, made his way toilfully through the flooded heading to the door, and succeeded in shutting it. This was, however, only managed with extreme difficulty and the exercise of great strength, for the door had got stiff on its hinges, and the diver was under water nearly an hour and a half. The clearance being at length effected, the work was carried on vigorously, and by the autumn of 1881 the two headings met, and a through passage was obtained. Prior to this, however, viz., in April, 1881, a slight but troublesome mishap had occurred. While the brickwork from the sea-walls shaft was being completed, a hole ten feet across was found in the marl near the Gloucestershire shores, and through this the water again rushed in too strongly for the pumps. By the use of clay-puddle the hole was filled up, and the pumps cleared out the water. By the autumn, as we have said, the junction between the two cuttings was effected, and all went on well until October, 1883, when another catastrophe took place, by which the whole work was again threatened with destruction. As mentioned already, the level of the tunnel was lowered after the first flooding, and while the men were at work in these lower levels, on October 18, 1883, the spring, which had burst through in 1879, was again tapped, and the water rushed in in enormous volume. The inflow was estimated at 27,000 gallons a minute, and very soon a considerable portion of the completed work was flooded. Once more the diver Lambert came to the rescue, but this time with assistants. Again a door had to be reached and closed, five hundred feet from the bottom of the shaft. Placing one assistant at the foot of the shaft, and another two hundred and fifty feet forward, with the air-tube, he made his way to the door, and, as before, succeeded. Meanwhile the pumps had checked the flood, and additional pumps being laid on, the tunnel was cleared in about a fortnight. So far, the two most serious interruptions had come from the fresh-water spring, but the contractors had yet to deal with an inroad from the river. On one occasion a huge tidal wave flooded a portion of the workings, but this was soon dealt with, and to guard against a repetition, flood banks were eventually erected with a height of five feet above the highest flood known. All these obstacles at last surmounted, the work was hastened on, and in October, 1884, the chairman of the committee, Sir D. Gooch, was able to pass through from the English to the Welsh heading. A year later the first train went through; after September 1, goods and mineral traffic will be established, and probably within three or four months, after some completing operations have been effected, the whole of the new system will be available also for passengers. The total length of the tunnel is 7,664 yards, or, say, nearly four and one-half miles, and to these the open approaches add something like the same distance. The height of the tunnel is twenty feet from the rails, with a width of twenty feet. In the deep parts of the work the tunnel is lined with Staffordshire and other vitrified bricks set in cement, three feet thick, but as it rises the thickness is gradually reduced to two and one-fourth feet. The water, at what is called the "shoots," is thirty-three feet at low water, and ninety-one feet at high water, and at this point the tunnel has a covering of forty-five feet, though under the depression called the "salmon pool" there is a covering of only thirty feet. On the Gloucestershire side the gradient is one in one hundred down to the lowest point under the "shoots," whence it rises one in ninety, the heaviest loads being expected from Wales. With a view to the drainage, a culvert five feet in diameter is provided, falling from the lowest point in the tunnel to the Sudbrook shaft. The water entering the works in the open cuttings will be intercepted at either mouth of the tunnel, and there pumped at the higher level, in order to reduce to a minimum the pumping at the Sudbrook shaft. It is believed that the pumping may be reduced to 5,000 gallons a minute, but unless the plan has been recently changed, permanent machinery is or will be provided, capable of four times that amount of pumping. Equally powerful and adequate ventilating apparatus is also provided. Altogether eleven shafts have been sunk — three on the English side, eight on the Monmouthshire side; and between 70,000,000 and 80,000,000 bricks have been consumed. Over 700,000 cubic yards of excavation has been accomplished, and, during one month, as many as four hundred yards were tunnelled. More than a mile of the tunnel was cut through the Pennant sandstone of the coal measure; half a mile through conglomerate overlying the Pennant, half a mile through shale of the coal-measure with occasional beds of coal, one of which was a foot thick, and the remainder was through red marl of the new red sandstone.

Heretofore the railway journey from London to South Wales has been the roundabout route *viâ* Gloucester; but the tunnel is twelve miles lower down the Severn than the railway bridge, and passengers will now travel to Bristol, and thence through the tunnel. The distance between London and South Wales will be reduced by fifteen miles, and even between Bristol and South Wales the time occupied will be shortened by about an hour. As to the cost, by the time everything is done, it will probably approach two millions, the whole of which is borne by the Great Western Company.—*Engineering.*

COMMUNICATIONS

THE DURABILITY OF ROUGH-CAST WORK.

KANSAS CITY, MO., September 7, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Will you kindly inform me, through your journal, as to the durability of rough-cast plaster-work and plaster ornaments as used on exterior of buildings, and what effect the weather would have upon them where the extremes are experienced, such as in Kansas City? Respectfully, etc., WILLIS J. POLK.

[ROUGH-CAST, properly tempered and carefully applied, will stand our changeful climate satisfactorily. At least, we used to be familiar with a house about one hundred years old whose external coat of rough-cast was in good repair, and the house dry and well preserved. Rough-cast used in small panels on the pseudo half-timbered houses just now in vogue is rather difficult to make tight at the joints; but in broad surfaces we believe it would give reasonable satisfaction.—EDS. AMERICAN ARCHITECT.]

A SIMPLE INTERMITTENT DISCHARGE FOR SUB-SOIL IRRIGATION.

DETROIT, MICH., September 8, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—I notice in Mr. T. M. Clark's "*Building Superintendence*" a description of the system of sub-soil irrigation, and page 207 shows a cut of cesspool with inlet and discharge pipes. I find in reading further concerning this system (which is practically unknown in this vicinity) that an *intermittent* discharge into the absorption drains is considered essential to permanent successful operation, and with a cesspool as above, I cannot see how the outlet pipes would ever become flushed, but the sewage would merely trickle through from time to time as the inlet discharged into the cesspool. Will you kindly give a description of an arrangement, automatic, if possible, by which the sewage could be discharged into the absorption drains *intermittently?* Respectfully, M. W.

[THE simplest form of intermittent discharge we know of is one we have used several times with success. It is obtained by dividing the cesspool into two portions, one the collector or ordinary cesspool, and the other a tight brick chamber, in which is hung a carefully-weighted tilting-pan, made of galvanized-iron and holding thirty gallons or so. The overflow-pipe leads from the large portion of the cesspool and discharges into the tilting-pan, which gradually fills, and, when full, tilts over and empties into the tight chamber in which it is hung. From the bottom of this chamber lead off the lines of open-jointed pipes, as may best suit the contour of the ground. The pan, when empty, at once swings back into place, ready to receive its next load. As the open-jointed pipe should be within one foot of the surface, a hill-side affords the best site for this kind of apparatus, though a level piece of ground can be used if it be possible to build the cesspool somewhat above the level of the ground, and protect it and the inlet-drain by grading-up about and over them. The level of the sewage in the cesspool proper has to be about two feet above the level of the outlets into the distributing drains.—EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

OLD PERSIAN PALACES AT SUSA.—A vast quantity of relics, the results of the excavations carried on for a long time on the site of ancient Susa by M. Dieulafoy and his companions, have arrived at the museum of the Louvre. They were brought to Toulon in a transport from Bassorah, and filled 215 chests, that weighed over 40,000 kilogrammes (nearly 40 tons.) The chief contents are: (1) Two fragments of a frieze of enamelled earthenware, adorned with lions in bas-relief, from the principal entrance to the palace of Artaxerxes Mnemon. Both fragments are over 13 feet high, by nearly 30 feet long; (2) a similar fragment of a frieze from the palace of King Darius Hystaspes, adorned with 12 figures of the loyal body-guard, the famous "Immortals." This piece is 11½ feet high, by nearly 40 feet long; (3) two fragments of a stair-case in same material; (4) two fragments of terra-cotta friezes, showing fantastic animals — they are together over 20 feet long by nearly six high; (5) the capital of a pillar from the palace of Artaxerxes, representing a two-headed monster — it is over 16 feet high by 13 feet in width; (6) a collection of cut gems, numbering about 300, which seem to date from the earliest period of the Sassanide dynasty; (7) a large number of arrow-headed inscriptions on stone or glazed earth, mostly from Susa; (8) a considerable collection of bronze coins from Susa and the neighboring districts, from the time of the Parthians and the Sassanides; (9) a quantity of bronze ornaments and mountings of the outer doors of the palace of Artaxerxes; (10) a number of statuettes of bronze, ivory, terra-cotta and marble, a quantity of vases and toilet ware; (11) a mass of objects of comparatively small value, enamelled Sassanide vases, Parthian urns for the dead, iron and bronze weapons, instruments, and skeletons. Beside these things, the expedition took plaster casts on a large scale of portions of the palace of Artaxerxes, also photographs of the neighborhood of Susa, the sites of the explorations of various old monuments and ruins in other parts of Persia. It is believed that five or six months will be required to get all the things in order. Diszful, the

modern village on the site of Susa, is about 400 kilometres from Bassorah. At first the expedition encountered much opposition from the natives, owing to a report that the Frenchmen wanted to carry away the body of the prophet Daniel, which is supposed to be buried in a cave in the neighborhood, a great object of pilgrimages.—*London Times.*

A Chinese Earthquake Detector.—In China there is a curious device to make record of earth tremors. One of the instruments is thus described: "It is of copper and is shaped like a wine bottle. Inside is a little pillar so placed as to move in eight directions. On the outside of the bottle are eight dragon heads, each of which contains a ball. Underneath these heads are eight frogs, so placed that they appear to watch the dragon's face, so that they are ready to receive the ball if it should be dropped. All the arrangements which cause the pillar when it moves to knock the ball out of the dragon's mouth are well hidden in the bottle. When an earthquake occurs and the bottle is shaken, the dragon instantly drops the ball, and the frog which receives it vibrates vigorously. Any one watching this instrument can easily distinguish earthquakes. Once upon a time a dragon dropped its ball without any earthquake, and the people therefore thought this instrument was of no use, but after two or three days a notice came saying that an earthquake had taken place in Rosei."—*Philadelphia Saturday Review.*

Lightning-Holes.—Professor Brun has published in the *Archives de Genève* an interesting study on the so-called lightning-holes to be found in the High Alps. He and other investigators have found them at heights of from 3,348 to 4,000 metres, or between 11,000 and 13,000 feet above the sea level. Usually they are found on summits. Sometimes the rocky mass, which has been vitrified in the passage of the electric fluid, presents the appearance of small scattered pearls, sometimes of a series of semi-spherical cavities only a few millimetres in diameter. Sometimes there are vitrified rays going out from a central point to a distance of four or five inches. Sometimes a block detached from the mass appears as if bored through by a cannon-ball, the hollowed passage being quite vitrified. The thickness of this vitrified coating or stratum never exceeds a millimetre, and is sometimes not more than the quarter of that depth. The varying colors which it presents depend on the qualities and composition of the rock. The same may be said as to its transparency. On the Rungfischhorn the glass thus formed by the lightning is black, owing to the quantity of actinolith which the rock contains. It is brown on La Ruinette, the rock consisting of fieldspar mixed with gneiss containing chloride of iron. Under the microscope these lightning-holes display many interior cavities, which must be attributed to the presence of water in the rock at the moment of melting by the electric discharge. This vitrified material has no influence on polarized light.

Prototypes of Hollow Beams in Nature.—We have many instances, in the vegetable kingdom, of the extreme rigidity and strength of circular tubes: the stems of the grass tribe generally are remarkable for their lightness and strength; the common wheat-straw and the river reed are familiar examples in our own climate; but in the tropics the gigantic stems of the bamboo and other grasses tower sixty feet above the jungle, and are extensively employed as beams for covering buildings, and even, in some cases, as the transverse bearers of light suspension bridges. The angler's bamboo rod is the most perfect of tubular beams. Tapered off in proportion to the strain, its silicious coat (as in all the grasses) defies compression, while it is internally lined with woody fibre to resist extension in every direction. Its strength, lightness, and stiffness are thus equally marvellous, and we cannot fail to be struck with the provision of diaphragms throughout the whole tribe, to preserve the circular form, which addition would certainly have much modified the results obtained from thin circular and elliptical tubes of wrought iron. The bones of animals are oval, the depth being always in the direction of the transverse strain. But the more special province of the bones appears to be their action as pillars or struts, in forming immovable fulcra for the reaction of the muscles; and since any yielding would involve a great increase of motion in the muscle itself, we find bone among the most incompressible of known substances. The square form of stem characterises a very extensive natural family of plants—the labiate tribe, of which the beautiful dead nettle of the hedgerows is an example, though it is difficult to assign any mechanical reason for this peculiarity, which appears rather to be typical of the general development of these plants. But in the feather-bearing part of the ordinary quill we have a most remarkable example of the strength of the rectangular form. Here, again, every dimension is tapered down in proportion to the strain, with an accuracy defying all analysis; the extended and compressed portions are composed of a horny substance of prodigious strength, though extremely light and elastic. The beam is not hollow, but to preserve its form it is filled with a pithy substance which replaces the clumsy gusset-pieces and angle-irons of the tube without interfering with its pliability. The square shaft is peculiarly available for the attachment of the deep vanes which form the feather, and, as the angular form would lacerate its active bearer, an exquisite transition to the circular quill at the base is another striking emblem of perfection. The imitation of such mechanics, so wonderfully adapted to such a medium, appears hopeless; but we are indebted to the flying philosopher, if his attempt only calls attention to such design, and induces us instructively to contemplate the beauty of a feather.—*Edwin Clark.*

A few of our correspondents among architects and builders, especially in the Middle and Western States, have recently referred to the probability of a decline in rents of offices and houses in cities and towns. There are evidences of this downward tendency here and there. The information available is not sufficient to justify the formation of an opinion. It is well, however, that attention is being called to the fact, if the fact exist, and to the probability of such a result. It is, of course, possible to erect more houses and more offices than can be occupied, and, on the other hand, it is possible for mishaps of some kind or other to overtake renters and oblige them to adopt economic measures. Competition may be, and probably is, setting in a little more actively among builders and landlords. It does not follow that any harm will flow from this. There is nothing to be gained by undue building activity, and nothing to be lost by reasonable competition. Low rents induce persons of small means to occupy houses of their own. High rents crowd people together in undesirable localities. One of the effects of this competition, be it much or little, will be to stimulate architectural and other improvements, inside and outside; in short, to make better houses, and make them more attractive. Perhaps too little attention has been given to this feature by architects and builders. There is no use in causing alarm by predicting a falling off in demand for house, shop, or office room. The demand must, of necessity, continue. The necessities of the people are constantly expanding, and their ability to enjoy finer things is increasing. From this out, there will be a departure in the direction of what might be termed luxuries in house finishings. Public taste is improving. The old-style house is going. Those who supply building material have, of late, frequently spoken of a sort of recklessness among buyers and renters of houses for elegance within and without. The demand for building material, from decoration down to stone and lumber, is very heavy. Usually at this season of the year demand moderates, and stocks accumulate. Material-men say that they have less on hand now than for years. Brick-makers, in several cities, are practically out of supplies, and besides, have contracts on hand which will absorb all their production to the end of the season. The manufacturers of slate state that their production this year has exceeded that of any former year, and that the prospects for next year are good. The manufacturers of cements have done remarkably well. The lumber-dealers in the Northwest will probably succeed in putting up prices for lumber, but it is doubtful whether the extraordinary supplies will allow the advance to be maintained. The New York, Philadelphia, Chicago and St. Louis consumption for the months of July and August, have been larger than for last year. Piece-stuff throughout the West is wanted faster than it can be supplied, but manufacturers are not anxious for an advance. Prices of lumber are firmer all along the Mississippi. In some localities, however, the opinion prevails that prices will decline. From one hundred and fifty to two hundred cargoes of lumber are arriving weekly at Chicago. The canal-boat trade in the West is very active. Lake freights have advanced twelve and one-half cents from Michigan ports, owing to the active demand for coal and ore. Reports from Eastern lumber markets show great activity. In certain portions of New York timber is very scarce. All saw-mills are well sold ahead, and some mills are refusing orders. Large receipts of white and yellow pine are reported at Philadelphia and New York, and the tendency of those markets is to improvement. Manufacturing establishments in those centres are running full time, and there is a very active demand for all kinds of wood, especially hardwoods. Shingles and lath are in very urgent request, and a good many factories in New York and Pennsylvania are behind in their orders for sash, doors and blinds. Furniture manufacturers are quite busy, and have been liberal purchasers for maple, elm, walnut, oak, poplar, cherry, and two or three other woods. The iron-trade holds its own. Importation of foreign material has slackened up. Sheet-iron is in very active demand; nails are wanted in large supplies in both the East and West; but even under this active demand prices have weakened a little. Thirty thousand tons of rails were contracted for last week at $34.00. Builders' hardware of all kinds continues in abundant supply. Under the increasing demand manufacturers, in common with manufacturers in other branches of the iron trade, anticipate a little improvement. All the great industries continue in a healthy condition, and buyers have about concluded that the wisest policy to pursue is to place orders for supplies to be delivered during the next three or four months. There is nothing in the situation to justify the apprehensions of a general advance in prices. The manufacturing interests themselves do not desire it. A vast amount of capital might be tempted into reproductive channels, where its employment at remunerative rates could only be temporary. Reports from between twenty and thirty of the leading railroad lines show a further improvement in returns. The volume of traffic is increasing. There is also a steady increase in bank clearings in the larger cities. The earnings of railroads show an increase for August, as against August last year, and also a slight increase for the seven months of this year, as against the same seven months of last year. Textile manufacturers are buying raw material freely, and crowding productive capacity, with well-grounded confidence that the demand will absorb all the goods they will have the courage to make, and the judgment to make in attractive shapes and styles. The coal trade is beginning to improve both East and West. The anthracite combination will likely make the October output three and one-half million tons. The bituminous mines will be operated with more activity after October 1. The hardware manufacturers in the New England States have distributed more goods during the past three months by ten per cent than last year, and the larger concerns are employing additional force in order to run their capacity to the fullest extent. In the heavier industries the same favorable reports are received this week. There are twenty-five locomotive works in the country, and the only idle one will shortly resume with a good supply of orders. There are one hundred and eight car-wheel works in the United States, and, so far as known, none are idle, and railroad managers are placing orders for winter and spring supplies. All of the eighty-five car-works have business enough to run ten hours a day, and some few are running over time.

On the other hand, it is necessary to avoid self-deception in these encouraging indications. Never in our history was there greater need of wise and true statesmanship. Our finances are to-day in a healthy condition. There are the same dangers to-day as there always have been of making mistakes and not properly providing for the expanding demands of the country. The possibility of a scarcity of currency has been referred to by careful thinkers. The danger is not on the surface. Other thinkers have pointed to the danger we are in from over-production, and are loud in their protests against a too rapid increase of industrial capital. The only protection against danger of this kind is the enlightenment of the public through trade combinations, well-edited special journals, and a more careful attention by the managers of our great industrial and business enterprises to the tendencies and influences and causes at work throughout the country at large. No one industry can succeed within itself; all are inter-dependent. A certain volume of currency is a necessity. A scarcity in that direction is the precursor, frequently, of trade depression. The producing interests are doing their full duty. The railroad-builders are seeking the aid of money-lenders to extend railway construction faster than absolute necessity calls for. Less unnecessary railway construction has been done this year than in any previous year, and there are fewer miles of road under receivership to-day than there have been for many years. The great bulk of railway mileage is earning fair dividends, and is opening up opportunities rapidly for new towns and cities, for new men and new capital.